The Hunt Study

Staffing and Apparatus Standards

1989

City of Paso Robles
Fire Department

EL PASO de ROBLES FIRE DEPARTMENT

STAFFING AND APPARATUS STANDARDS

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EXECUTIVE SUMMARY

A summary of the standards recommended in this report is presented as Table 1. (Definitions of terms used in this Table and throughout the report are presented in Appendix B).

CONCLUSIONS

Hunt Research Corporation strongly feels that the implementation of these standards by the City of Paso Robles will provide a high level of protection of life and property for residents of the City on a cost-effective basis. However, there are several associated points to be emphasized:

These standards were developed as a set; that is, they are interrelated, and not independent. Thus, one standard for fire suppression services should not be implemented to the exclusion of others. For example, the City should not adopt company staffing and first alarm assignment standards without adopting the associated Reflex Time standard.

Furthermore, the staffing standard for Emergency Medical Services Basic Life Support (BLS) was specifically set at two EMT's in a Rescue unit, supported by an engine company, in favor of additional Rescue unit's.

These standards must be implemented together because the staffing and assignment standards are minimal based upon the fast Reflex Time. If a slower Reflex Time is experienced, than higher staffing levels would be required because a fire might have passed the flashover point and, therefore, require additional resources.

The Reflex Time standard is the key to the entire standard and to the provision of the proposed cost-effective service levels -- for both fire protection and the provision of emergency medical services within the City. In addition, the use of the Reflex Time concept provides the City with a series of options for cost-effectively providing a high level of service by applying available funds to areas that will produce the greatest benefit. For example, the Project Team has recommended continued use of the present volunteer firefighter program through a unique and cost-effective approach that combines the use of career and volunteer firefighter staffing.

TABLE 1

SUMMARY OF RECOMMENDED STANDARDS

Reflex Time

Fire

The recommended fire protection Reflex Time standard for the City of El Paso de Robles is:

It is recommended that the flashover time of 9 minutes be adopted for the Fire Reflex Time standard. This recommendation is based upon the fact that 9 minutes is the average of the frequently-quoted range of 6-12 minutes. Therefore, the recommended Fire Reflex Time standard is:

> **"to initiate fire suppression actions within 9 minutes of ignition for at least 90% of all fire incidents, and 95% within 10 minutes."**

Emergency Medical Services

The recommended emergency medical Reflex Time standard for the City of El Paso de Robles is:

> **"to initiate definitive emergency medical assistance within 8 minutes of occurrence of life critical symptoms for 90% of incidents, with a maximum Reflex Time of 10 minutes for 95% of the responses."**

TABLE 1

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Apparatus/Personnel Location and Assignment Standards

Fire

It is recommended that base level city-wide standards be established for all engine company response districts that have a relatively light fire hazard level, defined as follows: less than 50% of the unsprinklered occupancies have a fire flow requirement of more than 1,000 GPM and there are no high life risk occupancies.

In this type of response district, the recommended first alarm assignment is:

(a) **First due engine companies are assigned to stations so that Fire Reflex Time standards (see Section III) are met.**

(b) **A minimum of 9 firefighters (including a minimum of 2 engines, 1 BLS rescue unit, and a duty Chief Officer) and meet the 9 minute Reflex Time standard in 90% of dispatches and a 10 minute Reflex Time standard in 95% of the incidents.**

Standards for the "moderate" class of response district should be used for those areas in which over 50% of the unsprinklered occupancies have a fire flow requirements over 1,000 GPM but less than 2,500 GPM. These districts represent moderate fire protection risks, and will generally be found in the downtown areas, but may exist or be developed in the future within the City of Paso Robles, e.g., new annexations, Paso Robles Airport etc.

In this class of response district, the recommended first alarm assignment is:

(a) **A minimum of 15 firefighters, including a minimum of 3 engines, 1 rescue unit and a duty Chief Officer, meeting the 9 minute Reflex Time standard in 90% of dispatches and a 10 minute Reflex Time in 95% of the incidents.**

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Apparatus/Personnel Location and Assignment Standards

Emergency Medical Services

The light and moderate first alarm assignments listed above include a BLS rescue unit with two firefighters staffing the unit. This standard is based upon:

- Two qualified firefighters contribute the resources to meet the recommendation.
- The availability of emergency medical personnel on the fireground are invaluable for rescue and treatment of injured civilians and firefighters.
- The use of BLS trained firefighters satisfies both of the above addressed needs. Standards include:

(a) **That the Fire Department Rescue unit be used to support engine company E.M.S. activities pursuant to established policy.**

(b) **That at least one Fire Department BLS Rescue unit, staffed by two firefighters, be automatically included in the dispatch for all structure fires occurring within the City of El Paso de Robles.**

(c) **That the City of El Paso de Robles support a Fire department program to provide 24 hour Basic Life Support Services (BLS) within the City.**

Company Staffing Standards

Fire

Considering the Scope associated with this project, and the difficulty in setting rigorous quantitative staffing standards, it is recommended that staffing standards for engine, ladder truck, and rescue units be based on:

(1) The minimum number of personnel required to safely

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Apparatus/Personnel Location and Assignment Standards

perform a basic function critical to the protection of life and property.

For structural fire incidents, this basic function will vary by the level of risk, i.e., type of occupancy, the total number of personnel and apparatus. The emergency medical functions described will be for Basic Life Support.

The following recommended approach is a result of a review of current and anticipated Departmental operational demands. The established functions to be used in deriving the staffing standards include:

Fire Suppression

Engine Function:

Moderate:	Enter a smoke filled commercial building and place two 200 gpm streams into operation with engine operating from the hydrant.
Light:	Enter a smoke filled dwelling unit and place a 200 gpm (minimum) stream into operation with engine operating from the hydrant.

(a) **First-line engine companies should be staffed with a minimum of three on duty career firefighters (a combination of career and volunteer firefighters.)**

Ladder Truck Function:

Moderate:	Aerial to roof of two-story building, commence ventilation.
Light:	Aerial to roof of two-story building, commence ventilation.

(a) **The recommended minimum staffing level for performing the listed truck functions is three firefighters.**

Emergency Medical Services

The recommended Basic Life Support (BLS) function to successfully conduct patient assessment, is to be able to initiate

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Apparatus/Personnel Location and Assignment Standards

CPR when cardiac arrest has occurred, and assist in preparation of patient transport as rapidly as possible.

(a) **That City of El Paso de Robles Fire Department Rescue units be staffed by a minimum of two EMT-1 personnel.**

Support Staffing Standards

Field Supervision

Field supervision in the fire service normally involves a combination of management, administrative and incident command duties. Such supervision, to varying degrees, is required in all fire departments.

(a) **It is recommended that the field supervision standard providing for management, administration, and incident command functions for Shift Duty Chief Officers permit a maximum span-of-control of 5. That is, a field supervisor be permitted to manage up to five units (engine/truck/rescue units) in any combination.**

Administrative Clerical

The number of administrative/clerical personnel required by each department is, of course, generally determined by the corresponding workload. The workload results from the functions performed by the Department at all levels, i.e., Administration, Operations, Fire Prevention, etc. Thus, the recommended standard:

(a) **One administrative clerical position should be provided for each five input persons (career and volunteer) and one-half a position provided when the number of input persons is one, or two, then converted to a full-time position when the number of input persons reaches the three level; an additional staff member should be added on/or before the number of input persons reaches seven.**

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Fire/Rescue Apparatus Assignment and Station Locations

Based upon calculated average response times for both fire and EMS incidents, and using Reflex Time as the basis for measuring all of the components involved in an emergency response, the following fire response recommendations are made:

(a) **The City of El Paso de Robles should deploy its fire resources in order to initiate suppression actions prior to flashover.**

(b) **A new Fire Station should be constructed in the area of Highway #46 and Golden Hill Road that would meet the needs of the City for the next 50 years.**

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Recommended Fire Department System Design

The fundamental concept of the Recommended System Design is the provision of a high level of fire protection on an equitable basis to all residents and businesses within the City of El Paso de Robles. These services would be provided through:

(a) Expanded fire prevention programs, including stronger codes, enhanced inspection and enforcement, and an extensive program of public education.

(b) Increased use of smoke detectors and automatic suppression and detections in existing as well as new structures.

(c) A fourth fire station.

(d) Use of volunteer personnel in specialized applications, i.e., fire operations, prevention, public education, EMS response, and administrative support.

(e) Maintenance of efficient management, administration, and support of Department resources.

(f) A fire delivery system in place by the year 2000.

Thus, the system design consists of a comprehensive program to prevent the occurrence of fire, and to reduce the consequences should a fire occur, backed up by a strong manual suppression and public education capability -- that is, fire prevention becomes the fundamental basis for the City of El Paso de Robles fire protection system.

As a result of the process used in the preparation of this Report, the Hunt Research Corporation Team has compiled the following list of Department programs which the Team feels best reflects the actual mission of the Department. These programs are presented in descending order of importance as follows:

1- Department Priorities

(a) All residents and areas of the City should receive an equivalent base level of service. "Base Level of Service" is defined as the ability to provide Emergency

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Recommended Fire Department System Design

Medical Service at the Basic Life Support (BLS) level meeting Reflex Time requirements, public education, home inspections upon request, fire response and suppression meeting Reflex Time requirements, overhaul, immediate salvage, as required, to prevent further damage, response to hazardous materials incidents, rescue, and response to miscellaneous emergencies and other public service activities.

(b) The Fire Department should establish, as a result of recommendations contained within this Report, attainable Program Goals and Objectives, with the participation of City Management, Department personnel which includes career and volunteers on an equitable basis. These Goals and Objectives should reflect commitment and accountability on the part of all participants.

2- Department Mission in Priority Order

(a) Provide EMS at the Basic Life Support (BLS) level, with a goal of 50% survival rate for cardiac arrest.

(b) Occupancy Inspection and Code Enforcement.

(c) Public Education.

(d) Rapid response to fires, hazardous materials incidents, rescue and other incidents which may occur.

(e) Support for built-in automatic suppression systems.

(f) Manual suppression.

(g) Overhaul and immediate salvage.

(h) Public service.

(i) Users of special services to pay the actual "Marginal Cost associated with the service. These services would include: Commercial Inspections, Plan Checking, Hazardous Materials Planning, and Code Enforcement.

TABLE I

(Continued)

SUMMARY OF RECOMMENDED STANDARDS

Recommended Fire Department System Design

(j) Reflex Time should be adopted as the official response time basis for establishing service delivery response requirements.

(k) As the specific goal of initiating fire suppression action prior to the occurrence of "Flashover."

SECTION I

INTRODUCTION

1.1 Project Objectives

This report presents the results of staffing and apparatus standards study for El Paso de Robles Fire Department. The study was performed for the El Paso de Robles, California City Council. This study is the first phase of a Fire Master Plan project.

This project consists of two phases with the following objectives:

(a) Phase I- develop guidelines and recommendations necessary to establish standards for the assignment of fire/rescue, and E.M.S. apparatus and personnel to the City's fire stations.

(b) Phase II - develop a Master Plan for Fire Protection including guidelines, recommendations, and programs necessary to implement the Plan.

Specific components of Phase I are:

(a) Development of recommended standard(s) for certain elements of overall response time to a fire, hazmat or E.M.S. incident.

(b) Development of recommended standard(s) for vehicle and personnel deployment to a fire, hazardous materials or E.M.S. incident.

(c) Develop recommended standards for the placement of fire/rescue and E.M.S. apparatus into City fire stations.

(d) Development of recommended staffing standard(s) for each type of fire/rescue and E.M.S. apparatus, for field supervision, and for administration.

1.2 Fire Protection and Emergency Medical Service Standards

Standards for provision of fire and EMS services are critical to the planning for cost-effective delivery of these services. Yet, such standards have been elusive. Even after 200 years of fire service history, nationally-accepted standards still do not exist. Standards have been established by individual units of local government, or they have not been directly considered.

Thus, local government decision makers generally do not have answers to such questions as:

"What are the costs and benefits associated with each increment of time in responding to a fire or E.M.S. incident?"

"What are the costs and benefits associated with each additional person assigned to a fire or E.M.S. unit?"

These, and the other issues addressed in this study, are probably the most important and difficult issues faced by fire service decision makers. These questions are especially critical in reviewing budget requests submitted by fire/rescue agencies and making the difficult decisions associated with insufficient revenues; i.e., where should budget cuts be made and what are the consequences?

These questions have probably been raised by local government administrators and City Councils every year for the better part of this century. The answers today are really not any better than they were 50 years ago; and, in fact, are probably even more elusive because of such factors as:

(a) The impact of built-in fire protection systems (i.e., buildings with automatic detection and suppression systems may not require the response times and personnel compliments that would be needed for the same buildings without such systems).

(b) The generally decreasing number of fire alarms and increasing demand for emergency medical services.

(c) The difficulty in recruiting and retaining volunteers in some areas and the growing reluctance of employers to permit volunteers to respond from work. (This problem is frequently exacerbated by the increasing volume of E.M.S. incidents -- which are not of interest to some volunteers, especially when combined with the decreasing opportunity to fight fire and or the increase in the opportunity to contract a communicable disease as the result of patient handling.

The number of suggested reasons for the lack of such decision-making criteria, including:(1)

(a) The application of operations research techniques (the quantitative tool needed to develop these criteria) began approximately 40 years ago, but these techniques were not generally applied to fire/rescue problems until the last 20 years.

(b) Goals and objectives for fire/E.M.S. services are difficult to establish and may vary widely among communities.

(c) Data systems have not been developed which record the information needed to conduct analysis.

(d) Fire and E.M.S. incidents are extremely complex, and the development and consequences of a specific incident are very difficult to predict.

(e) When local government funds are readily available, there is often no incentive to determine the most cost-effective approach to service delivery.

(f) Productivity and effectiveness in the fire/E.M.S. services are difficult to measure.

(g) Fire departments have (especially in the past) tended to be insular, self sufficient organizations with little personnel turnover and infrequent use of outside specialists in operations analysis and planning.

The lack of research related to standards and decision making criteria was documented in a report by the New York City Rand Institute, which stated:

" .. we have found that except for studies of the deployment of firefighting men and equipment, there is little research related directly to local government policy. Most of the research is either fundamental, such as physical and chemical research aimed at an understanding of combustion phenomena, or engineering, such as studies of the combustibility and flammability of buildings and household materials."(2)

While this report was published in 1975, it is felt that the conclusion is still applicable today.

There have been many official declarations of the need for answers to the questions addressed in this report -- that is, for validated, accepted standards and associated criteria; for example:

(1) The Wingspread II Conference (a fire service needs assessment meeting) concluded that "productivity in the fire service is difficult to measure" and called for development of accepted productivity measurements and standards.(3)

(2) A program plan for the National Fire Prevention and Control Administration (now the U.S. Fire Administration)

contained a recommended project to establish resource allocation and response criteria.(4)

(3) The International City Management Association identified the development of these standards as a high priority research and development need.(5)

In response to these and other statements of need for standards, there have been several attempts to answer one or more of the above questions -- especially having to do with:

(a) the required response time for fire/rescue/E.M.S. units.

(b) the appropriate staffing level for fire/rescue/E.M.S. units.

However, none of these attempts has resulted in nationally accepted standards. In general, what has been accomplished is:

(a) The development of fire-growth curves (e.g., the "standard time-temperature curve") and predictions for the time at which "flashover" occurs (flashover is "the point at which fire gases and all combustible surfaces of a room blast into flame at once").(6)

(b) The developments of estimates of when brain damage occurs as a result of lack of oxygen, and mortality rates associated with initiation of medical aid within various time periods.(7,8)

Several projects have been initiated to develop national standards for company staffing or at least nationally recognized criteria for setting local standards; however, none has been completed. A feasibility analysis and research plan involving the ICMA, and IAFC was completed in 1976, but was never implemented.(9)

A survey of "Fire Suppression Crew Sizes" was completed in 1982(10) which was to be the first phase of an overall project to analyze the implications of different fire suppression company staffing levels. The remaining phases were not initiated because of "cuts in federal government funding for fire research."(11)

A document which has frequently been used as a fire department standard is the Insurance Services Office (ISO) Grading Schedule which contains criteria for:

(a) required number of engine/truck companies.

(b) maximum response distance.

However, this Schedule was developed for insurance rating purposes and not for use in determining required fire department resources. In fact, this Schedule includes the statement, "The Schedule is a fire insurance rating tool, and is not intended to analyze all aspects of a comprehensive public fire protection program. It should not be used for purposes other than insurance rating."(12)

The continued use of this Schedule for fire department planning, considering the above statement, is indicative of the need for corresponding decision-making criteria, and the current lack of such criteria.

Fire service experts have listed recommended standards in various publications. For example, Warren Kimball, writing in Fire Attack II, states that a three-person pumper crew could be used for low to medium hazards, but four persons are needed for engines and trucks protecting high hazards (p. 36). A four-person pumper crew is required to be able to advance and operate a 2 1/2" hand line (needed to fight large fires), leaving the operator at the pump.(13) Such recommendations are generally not quantitatively justified, and the marginal utility of alternative standards is not discussed.

The result of this lack of nationally recognized standards and decision-making criteria is that communities have not explicitly defined performance standards, or have developed their own standards. Frequently, such local standards and decision-making criteria, the City of El Paso de Robles City Council has taken the action, through this project, of addressing the establishment of specific standards meeting City needs.

1.3 Content of Phase I Report

The remainder of this report consists of the following Sections:

SECTION II - El Paso de Robles Fire/E.M.S. Environment, which contains a general description of the City, and the demand for fire protection and emergency medical functions; a description of the fire/rescue/E.M.S. services in the City; and the results of an overall analysis of fire/E.M.S. incident experience (e.g., current response times, number of fire and E.M.S. incidents, etc.).

SECTION III - Recommended Response Time Standards, which contains a general discussion of the response time issue, the definition of response time for fire and E.M.S. incidents, recommended corresponding standards, and associated rationale and justifications.

SECTION IV - Recommended Apparatus/Personnel Assignment Standards, which contains a discussion of resource requirements for fundamental types of fire/rescue and E.M.S. incidents, and recommended first alarm assignment standards for these incident types, with corresponding justifications.

SECTION V - Recommended Standards for Supervision and Support Personnel, which contains a discussion of supervision, administrative/clerical issues, and recommended standards and associated justifications.

SECTION VI - Recommended rationale for locating fire station based upon recommended Reflex Time Standards, including recommended fire station locations within the City and the rationale for apparatus acquisition and replacement.

SECTION VII - Recommended System Design for the City of El Paso de Robles during transition thru buildout, including the staffing standards to be used in support of the tri-part Fire/Rescue organization.

SECTION I

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SECTION II

EL PASO de ROBLES FIRE/EMS

ENVIRONMENT

This Section contains a general review of the factors which influence the provision of fire/EMS services in the City. These factors include demographics, land use, structural fire risk, the fire and rescue organization, available resources, and previous fire/rescue incident experience. In aggregate, such factors define the environment in which fire/rescue services are provided.

2.1 General City Characteristics

El Paso de Robles, California is a full service City located approximately one-half way between Los Angeles and San Francisco along U.S. Highway 101. The City is estimated to be 17 air miles east of the Pacific Ocean and 85 air miles west of the City of Bakersfield. The Planning Department of the City of Paso Robles estimates that the area of the City in 1990 approximated 8,375 acres, with a population of 17,500, representing an increase of approximately 144% since 1970. (An overall map of the City is presented in Figure 2-1). The population of the City has increased from 7,168 in 1970 to the present level, with a current annual estimated growth increment of between 5-6%. Figure 2-2 illustrates population growth trends for the period 1980-1990.

A recently prepared report from the Planning Department of the City of Paso Robles describes the 20 year growth projection for the City in the following manner:

o "Between 1990 and 1995: Growth control in the County will increase the demand for housing. 680 dwelling units (with a corresponding population increase if 1,700) per year will be built, mostly within approved tracts or currently in review."

"At the end of this period, the population will be 26,000."
"The balance of the Chandler Ranch will be annexed but not yet developed. Some annexation will occur to the southeast...."

o Between 1995 and 2000: "The City will have adjusted to the surge of annexation requests in response to County Growth Control and will assume a posture of managed growth. 500 dwelling units (with a corresponding population increase of 1,250) per year will be built."

"During this period, most development will be within current City Limits ...."

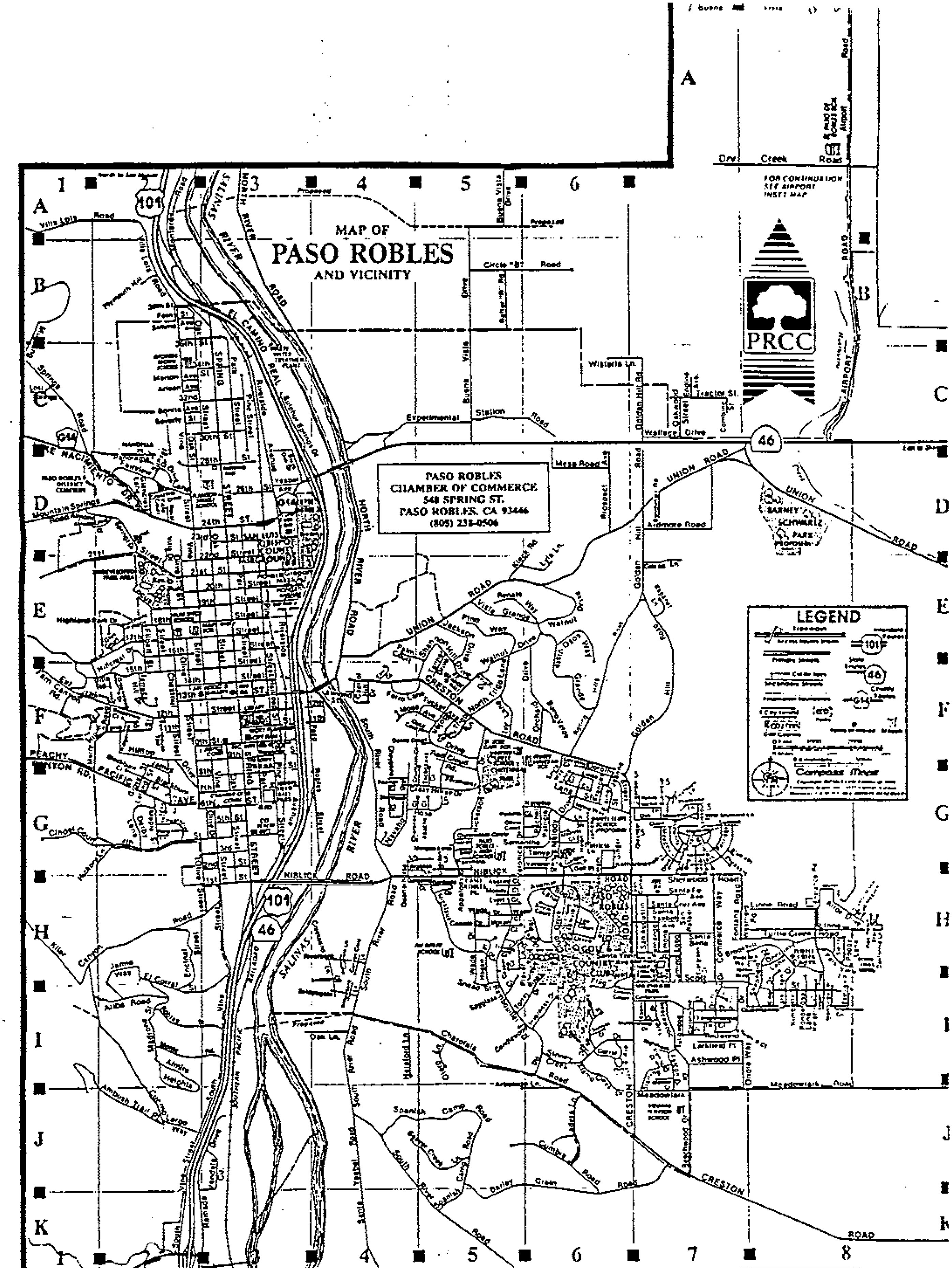
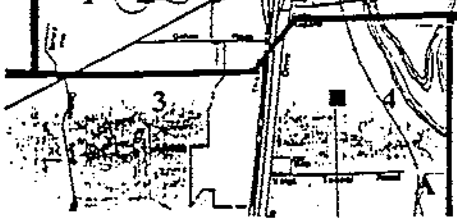

MAP OF
PASO ROBLES
AND VICINITY
PASO ROBLES
CHAMBER OF COMMERCE
548 SPRING ST.
PASO ROBLES, CA 93446
(805) 238-0506
PRCC
LEGEND
Compass Maps


FIGURE 2-1

1980-1989
Population Growth Trends

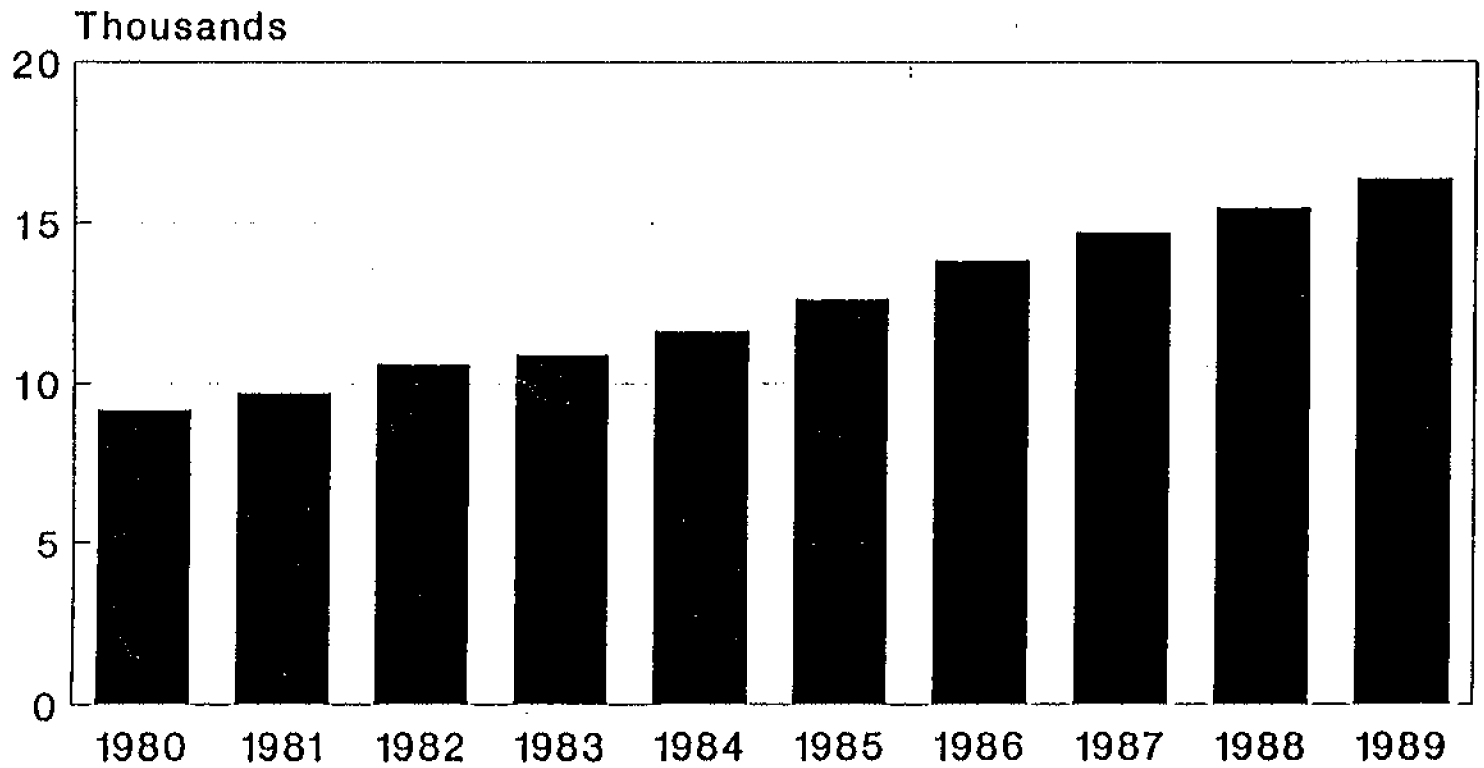


Figure 2-2

o Between 2000 and 2005: "Managed growth will result in a rate of 400 dwelling units (with a corresponding population increase of 1,000) per year. Most development will occur in the Chandler Ranch and in Subarea D."

o Between 2005 and 2010: "Managed growth will result in a rate of 300 dwelling units (with a corresponding population increase of 750) per year. Most development will occur within what is now the County portion of the Chandler Ranch and in annexations in the southeast in Subarea D."

By the year 2010, the 1990 estimated population of 17,500 is estimated will have grown to 41,000.

2.2 Paso Robles Fire/Rescue Organization

Fire and rescue services are provided by three (3) stations identified as:

1- **Main Station** - 623 13th Street

2- **Sherwood Station** - 235 Santa Fe Avenue

3- **Airport Station** - 3125 Buena Vista Drive

The locations of the three stations are shown in Figure 2-3. Fire stations are staffed by a total of three full-time career firefighters and fifty (50) volunteers who are assigned to specific stations when called upon to respond, e.g., 25 Main Station, 15 Sherwood Station, and 10 Airport Station. Volunteers are summoned by a combination of sirens, pagers, radios and/or telephones. Apparatus assigned to the three stations is identified under Table 2-1.

The Paso Robles Volunteer Fire Department is organized under a Constitution and By-Laws which provides the administrative policy for conduct of all firefighting personnel assigned to the fire organization which includes: Active, Honorary and Associate members. Personnel comprising the Department include Appointed Officers:

- o Fire Chief (Career Officer)
- o Assistant Chief (Volunteer Officer)
- o Fire Marshal (Career Officer)
- o Fire Engineer (Career Firefighter)
- o Training Officer (Volunteer Officer)

and,

Officers of each station who are elected from the members of that station and include Captains and Secretary/Treasurers. The make-up of the organization is truly representative of a Volunteer Fire Department. The Paso Robles Fire Department Organizational Chart is included as Figure 2-4.

TABLE 2-1

Paso Robles Fire Department

Apparatus and Equipment

STATION	LOCATION	APPARATUS
MAIN,	623 13th Street	(202)1941 Mack,750GPM
		(206)1960 Am. La France,1000GPM
		(209)1972 Ward La France,1500GPM
		(214)1989 Pierce,1500GPM
		(212)1988 Quick Attack
		(207)1989 Rescue
		(204)1978 Utility
		(205)1986 Chief Vehicle
SHERWOOD,	235 Santa Fe Ave.	(208)1986 GMC, 50GPM
		(210)1982 Grumman,1250GPM
AIRPORT,	3125 Buena Vista Dr.	(200)1987, Van Pelt,1250GPM
		(201)1974, Dodge,Crash
		(203)1952, Van Pelt,1000GPM

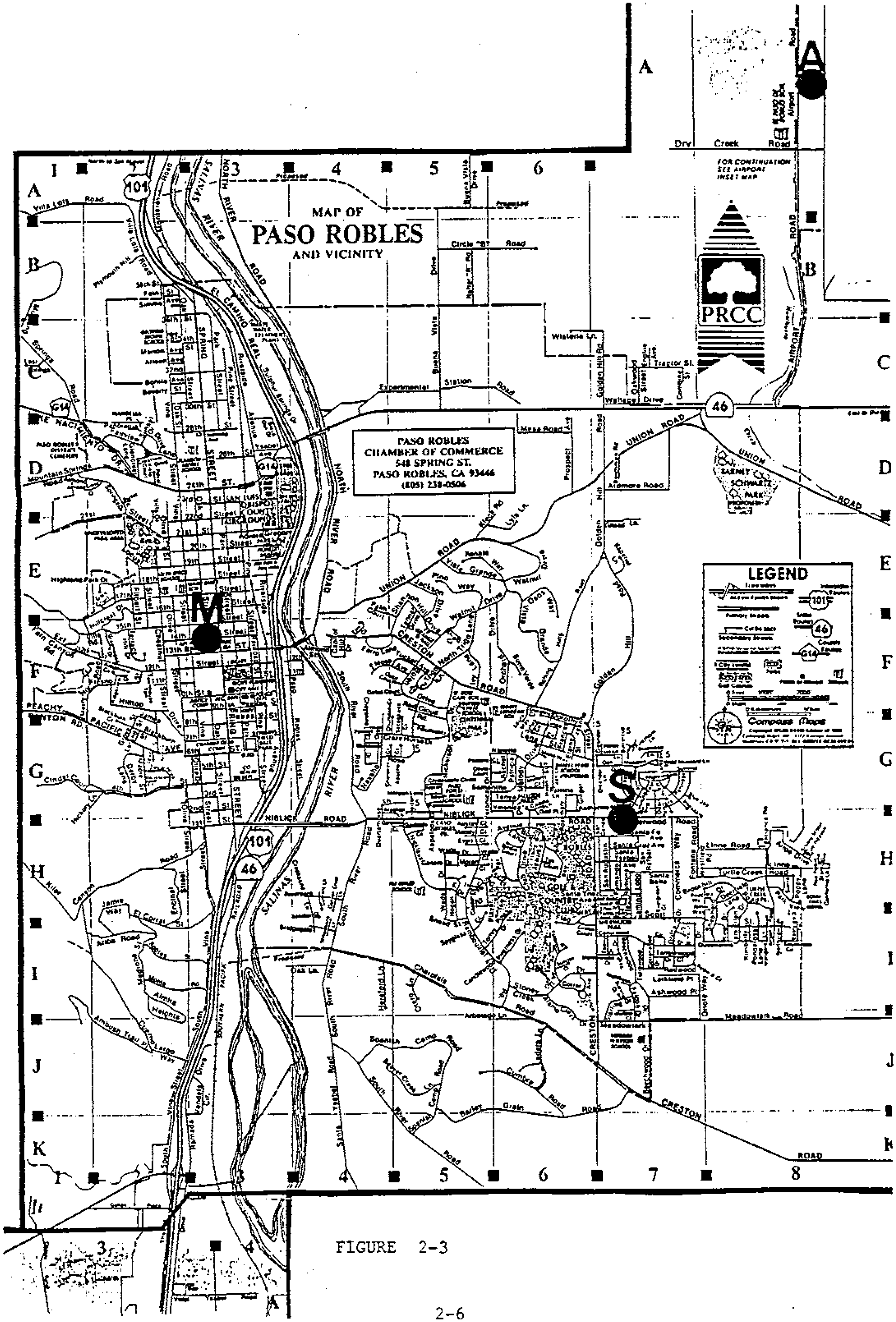

MAP OF
PASO ROBLES
AND VICINITY
PASO ROBLES
CHAMBER OF COMMERCE
548 SPRING ST.
PASO ROBLES, CA 93446
(805) 238-0506
PRCC
LEGEND
M
S
A
NIBLICK ROAD
UNION ROAD
CRESTON ROAD
NORTH RIVER ROAD
SALINAS RIVER
EL CAMINO REAL
SPRING STREET

FIGURE 2-3

Date: March 1990

PASO ROBLES FIRE DEPARTMENT

ORGANIZATIONAL CHART

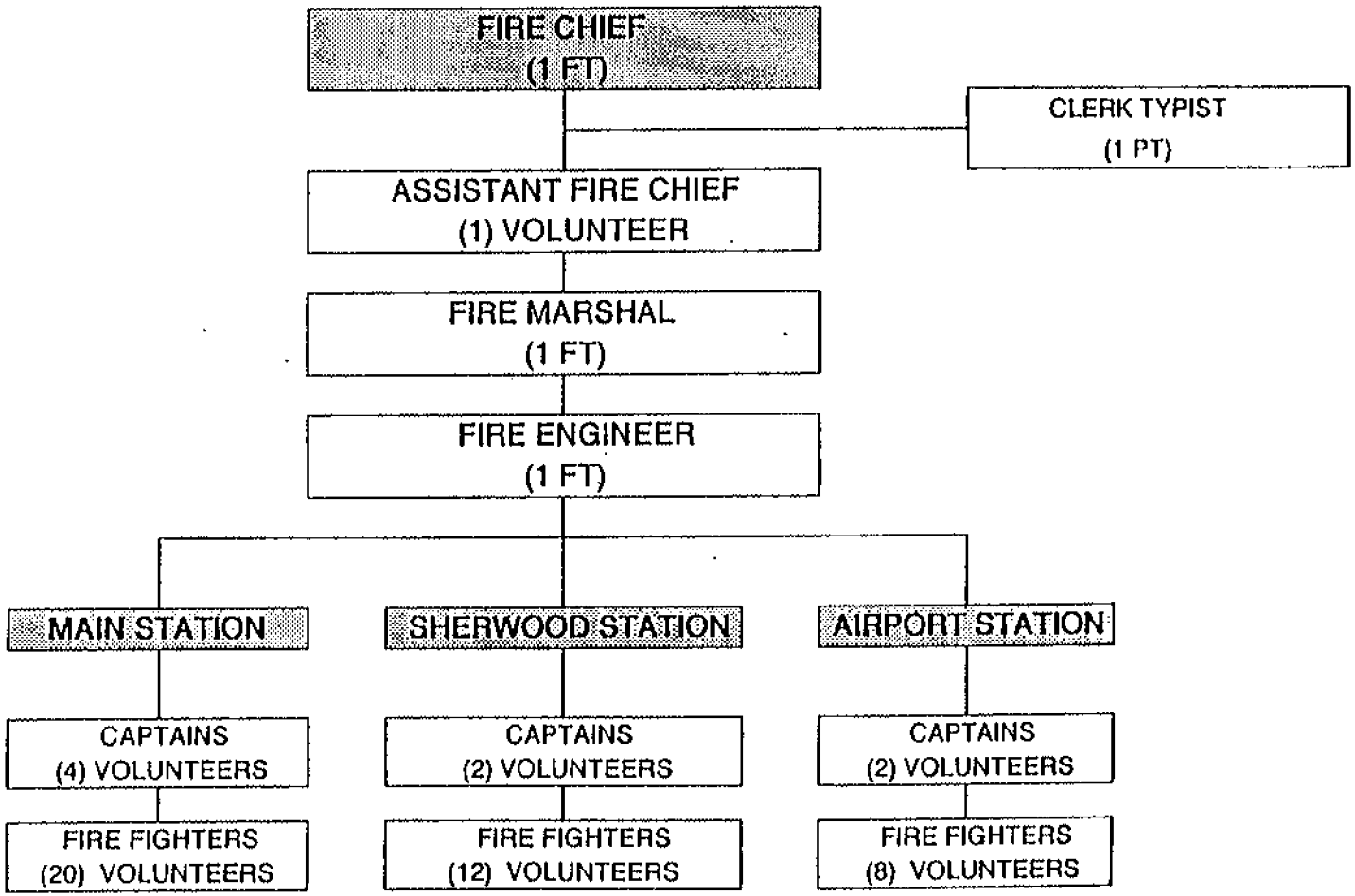


FIGURE 2-4

2.3 Fire/Rescue Experience

Historical trends in fire/rescue experience (e.g., number of responses and incidents, losses etc.) are described in this Section.

In general, the overall City of El Paso de Robles trend is similar to that being experienced throughout the nation, Table 2-2, illustrates the fact that the number of fires is going down, while the demand for emergency medical services is increasing. The following Figures, 2-5 thru 2-7, are used to illustrate City trends.

Fire Experience

Fires are not only going down in total, but also on a per capita basis, as shown in Figure 2-8.

The exact reasons for this dramatic decrease in the number of fires occurring in Paso Robles have not been quantitatively established; however, they are felt to include a complex interaction of the following factors:

- Improved building/fire codes.
- Improved plan check and inspection programs locally.
- Increased use of smoke detectors and built-in suppression systems.
- Improved public education programs.
- Increased awareness of fire danger.

All of these factors (and others) will probably continue to reduce the number of fires occurring within the City of El Paso de Robles. In fact, the use of built-in suppression systems is expected to expand significantly as new low cost systems are developed. Not only will more and more construction include built-in suppression systems, but the trend to retrofit existing buildings is increasing as the cost for new buildings continues to escalate. A number of cities have passed or are considering passing retrofitting laws, and several cities are even considering the advantages of a total retrofitting of the entire City.

As a result of these and related developments, the fire rate is expected to decrease significantly, but not to zero. There will always be a need for manual fire suppression services. The size and nature of the force providing such services will probably be different from that currently being provided. For example, in the future, the priority of engine company missions might be:

(1) Rescue and emergency medical services.

TABLE 2-2

COMPARRISON OF CITY OF EL PASO de ROBLES

WITH

UNITED STATES ALARM DATA FOR THE PERIOD 1986-1988

United States Data		City of Paso Robles Data
	1986	
19%	Total Fire	37%
6%	Structure Fires	8%
12%	Other Fires	29%
54%	All EMS	36%
8%	False Alarms	00%
3%	Mutual Aid	7%
15%	All Other Calls	23%
	1987	
19%	Total Fire	27%
6%	Structure Fire	8%
13%	Other Fires	20%
52%	All EMS	29%
10%	False Alarms	00%
3%	Mutual Aid	6%
15%	All Other Calls	38%
	1988	
18%	Total Fire	22%
6%	Structure Fires	5%
13%	Other Fires	17%
53%	All EMS	44%
11%	False Alarms	00%
4%	Mutual Aid	6%
14%	All Other Calls	27%

1980-1989

Ten Year Fire and Aircraft Response

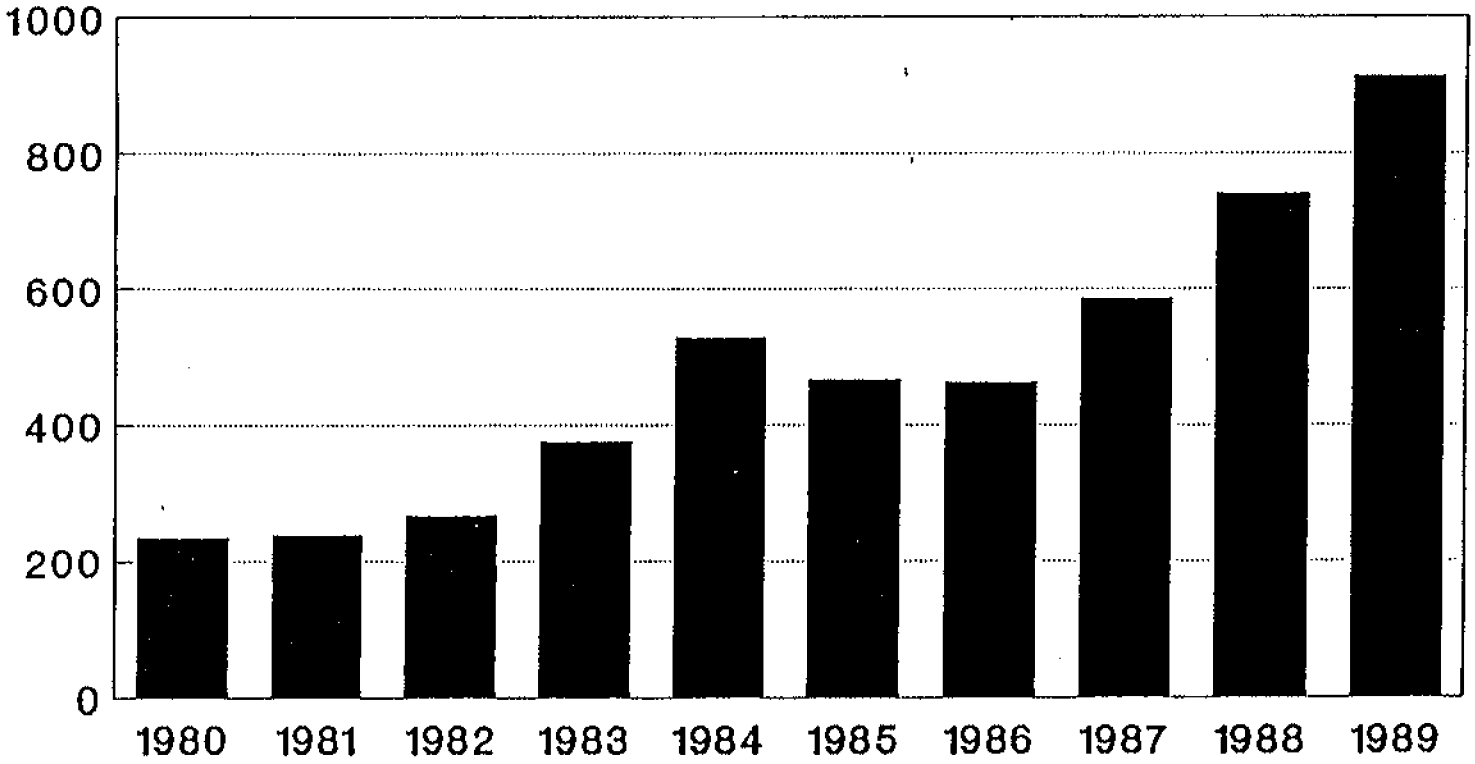


Figure 2-5

1980-1989
Ten Year Response By Type

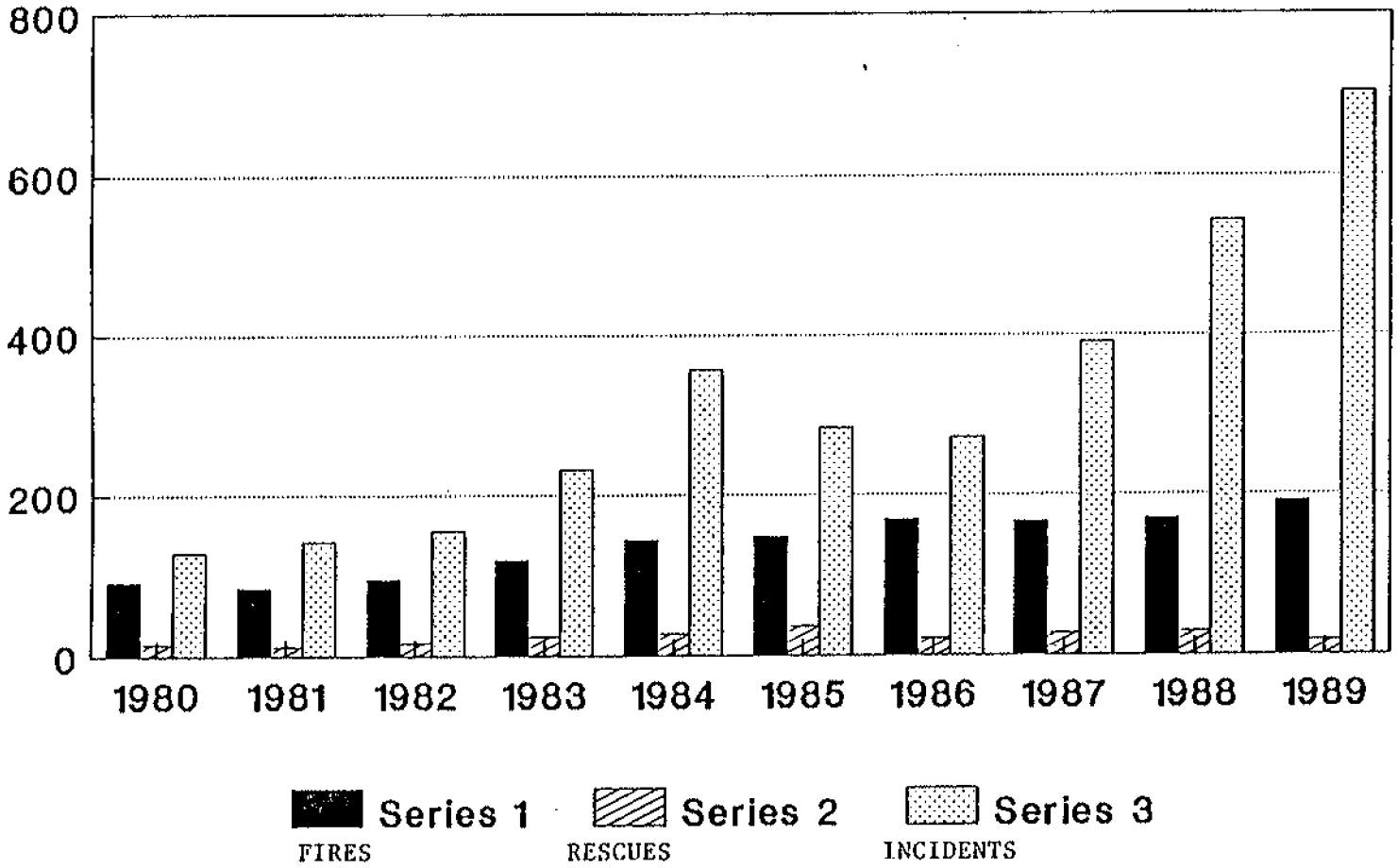


Figure 2-6

1980-1989

Ten Year Med. Aid/T.A. Response (EMS)

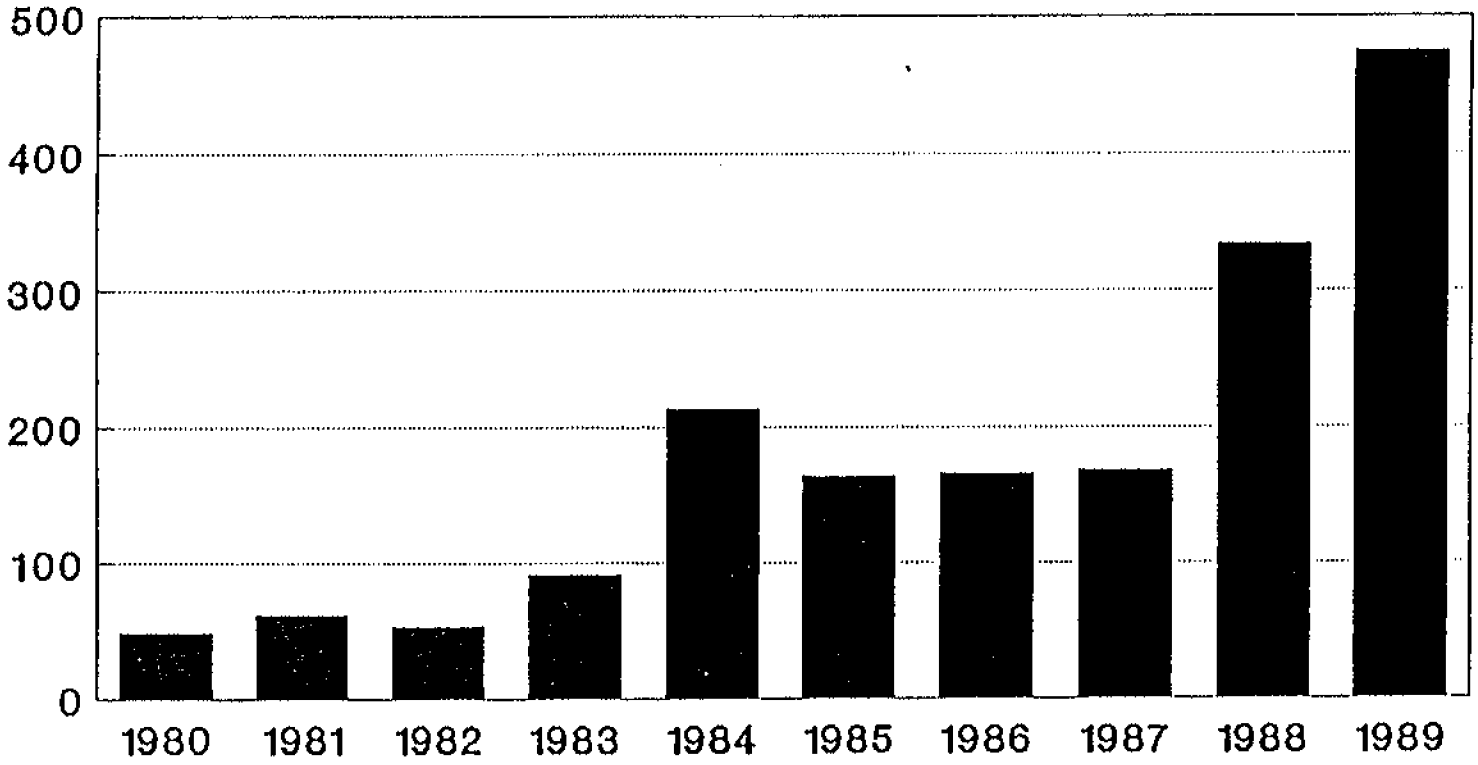


Figure 2-7

1980-1989
Per Capita Fire Trend

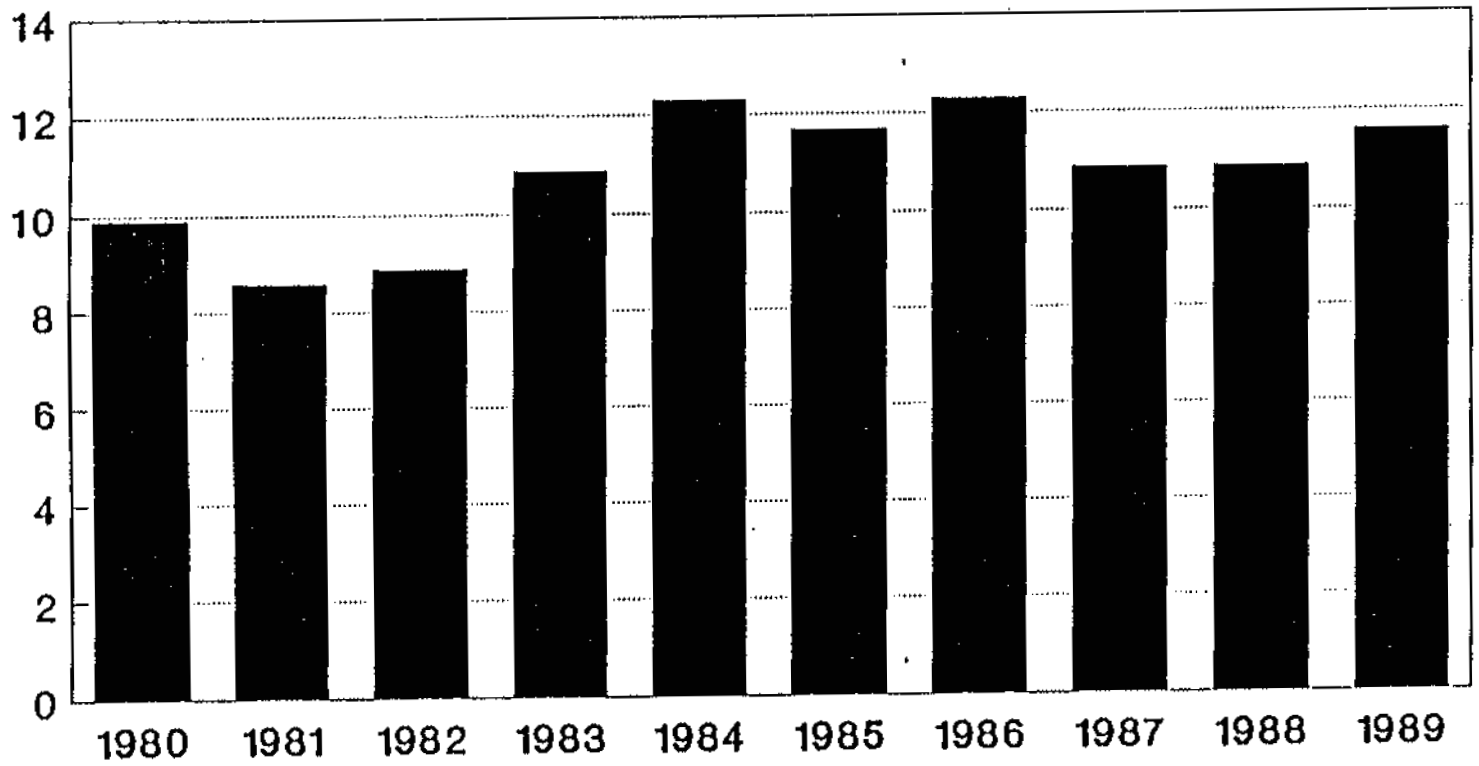


Figure 2-8

(2) Inspection and enforcement of maintenance of built-in systems.

(3) Supporting these built-in systems should a fire occur.

(4) Manual suppression.

(5) Overhaul and salvage.

Emergency Medical Experience

The number of emergency medical incidents has increased over the period 1980-1989, as shown in Figure 2-9. The incident rate, or number of EMS calls per 1,000 population, shown in Figure 2-10, increased between 1980 and 1989 and has remained relatively constant since then.

Other Incidents

The trend for incidents other than fire or emergency medical is shown in Figure 2-6. Such incidents include public service, hazardous conditions, good intent calls, etc.

Overall Trends

EMS incidents, as a percentage of the total of fire and EMS incidents has been increasing, Figure 2-9. For example in 1989, there were approximately 2.5 EMS incidents for each fire incident.

1980-1989
EMS AS A % of TOTAL INCIDENTS

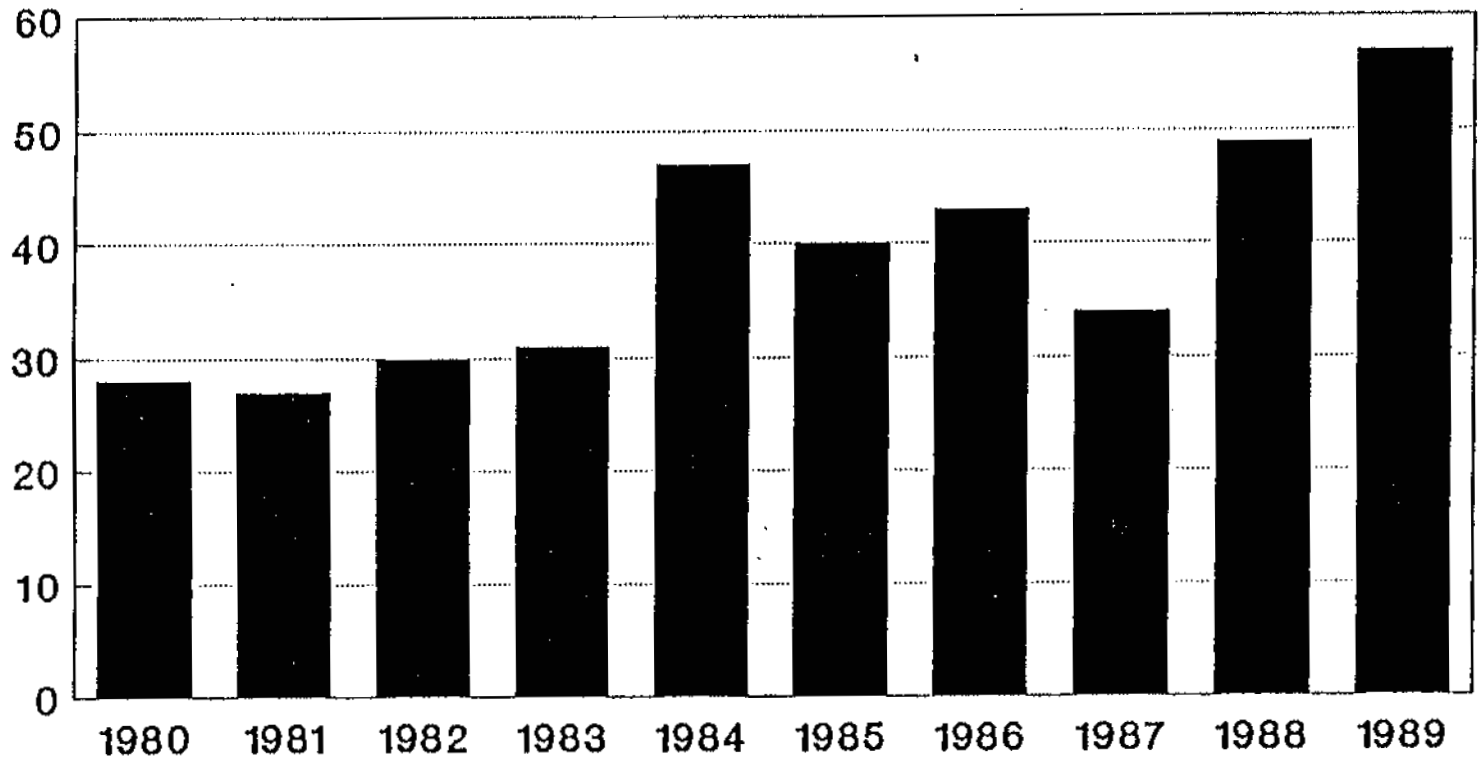


Figure 2-9

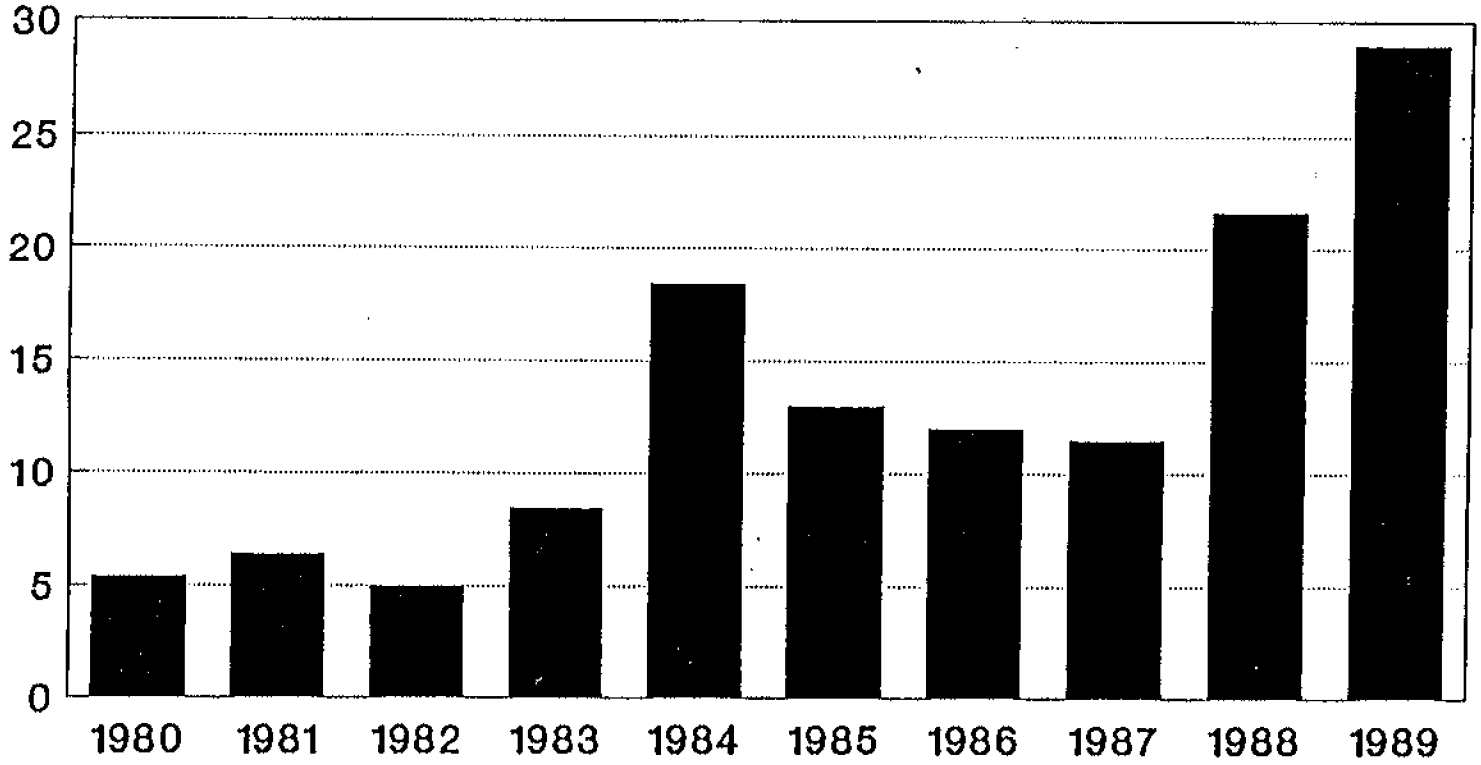

1980-1989
Per Capita EMS Trend (Thousands)
30
25
20
15
10
5
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

Figure 2-10

SECTION III

RECOMMENDED RESPONSE TIME STANDARDS

3.1 Definition of "Response Time"

The statement of work for this project includes the development of recommendations regarding response time standards. However, the term "response time" must be explicitly defined for this project because it is used in a number of ways throughout the fire service. For example, some communities define response time as, "the period of time between the receipt of a citizen's call and arrival at the scene," while others use the definition, "the period of time from receipt of dispatch by first due company to arrival on scene." A number of other definitions are also used.

Considering the intended use of project results, it is recommended that the City of El Paso de Robles approve the use of "Reflex Time" as the definition of "response time" for purposes of this project. Reflex Time is the time period from ignition to application of extinguishing agent, and is illustrated in Figure 3-1. An analogous period for a medical incident is the time from occurrence to initiation of field emergency medical definitive care, and is illustrated in Figure 3-2. The Reflex Time concept is recommended because it includes all of the components of the time period between occurrence and initiation of public service assistance. Thus, each time component can be identified and analyzed, and the results used to determine how the overall Reflex Time can be reduced on a cost-effective basis.

The amount of time required for fire detection and reporting (as an example) cannot be directly controlled by the City of Paso Robles, while the City's fire system response time is directly manageable. Fire system response time begins with the receipt of an alarm at the dispatch center and ends with the initiation of corrective action (e.g., application of water). It includes the following components:

(a) Time required to process the alarm and dispatch units.

(b) Turnout time -- the period from receipt of dispatch by a unit in quarters until the apparatus leaves the station.

(c) Travel time.

(d) Set-up time -- the period of time from arrival on scene until suppression or medical treatment activities are initiated.

By using Reflex Time as the basis for the City of Paso Robles

FIRE GROWTH vs. REFLEX TIME

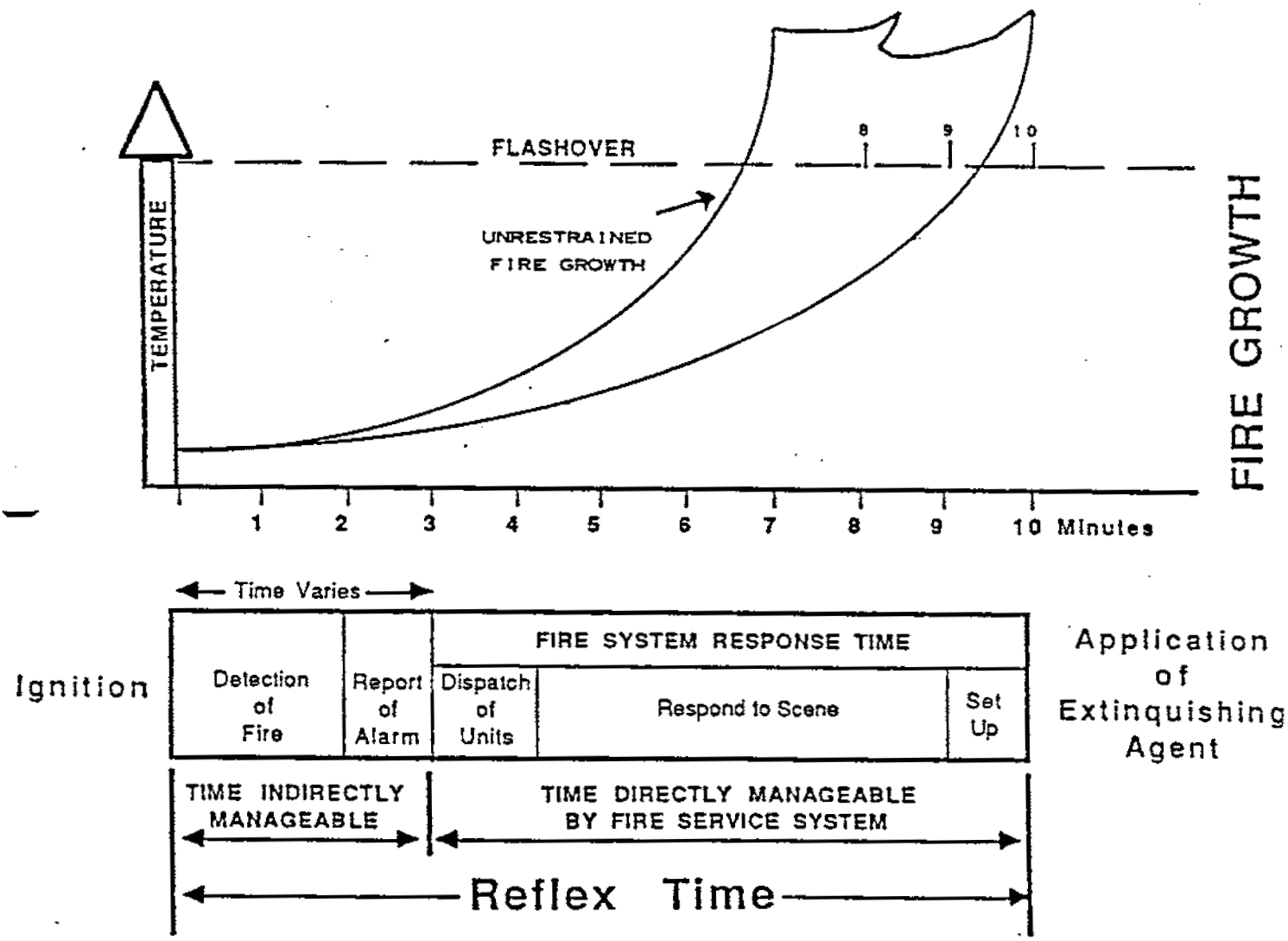


FIGURE 3-1

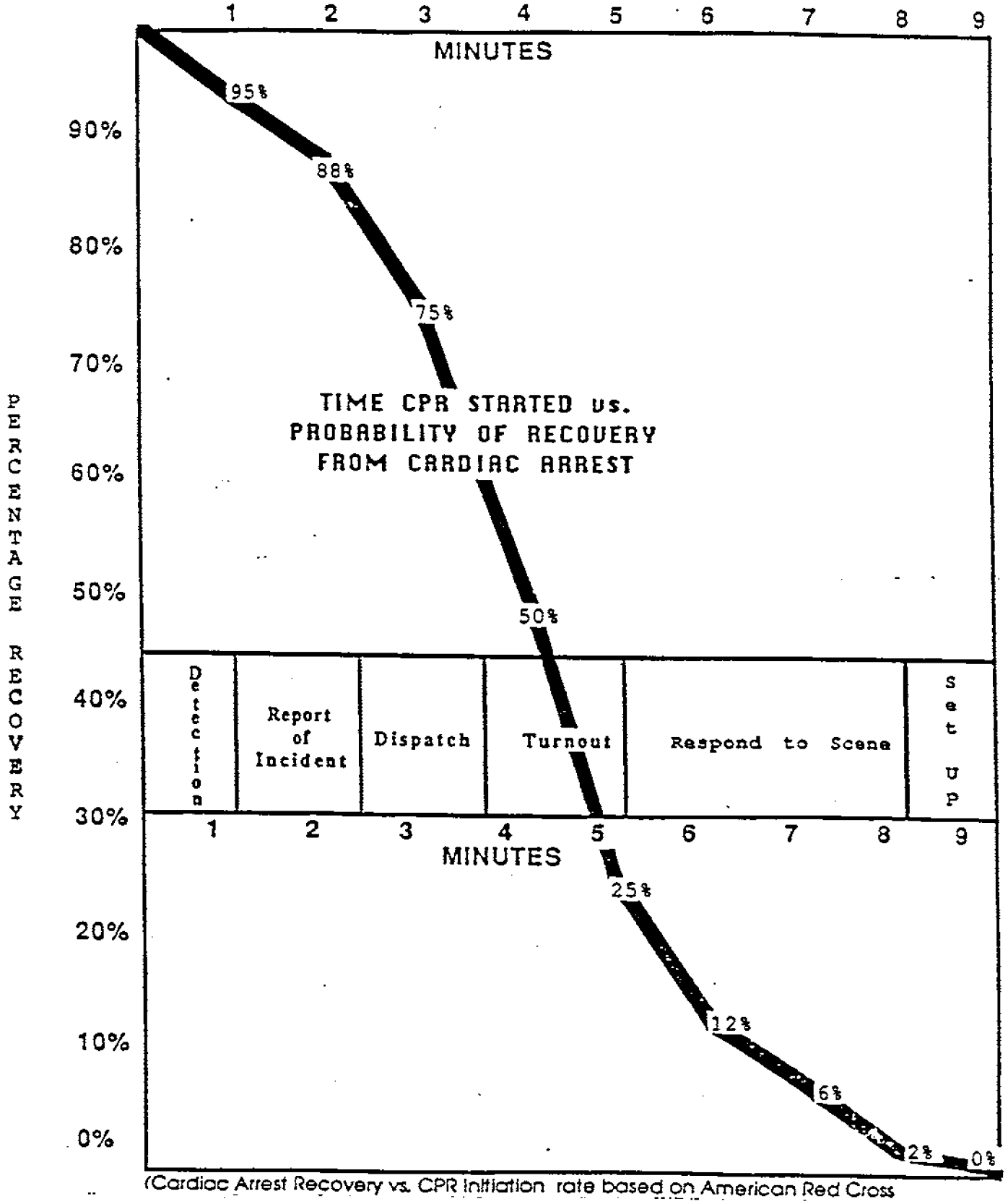

1 2 3 4 5 6 7 8 9
MINUTES
95%
88%
75%
50%
25%
12%
6%
2%
0%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
PERCENTAGE RECOVERY
TIME CPR STARTED vs.
PROBABILITY OF RECOVERY
FROM CARDIAC ARREST
Detection
Report of Incident
Dispatch
Turnout
Respond to Scene
Set Up
1 2 3 4 5 6 7 8 9
MINUTES
(Cardiac Arrest Recovery vs. CPR Initiation rate based on American Red Cross

FIGURE 3-2

response standard, all components of the time period can be considered for improvement and resources can be applied in the most cost-effective manner.

There is a nationwide trend toward the use of Reflex Time concept in planning for fire/rescue service delivery. For example:

- "Despite (the) commonly accepted definition of response time, the sequence of events that must be considered is that from ignition to the initiation of firefighting activity ... any response time reduction strategy must involve an examination of the time from ignition to intervention."(1)

- The fire and rescue services report to the Arlington County (VA) Board uses a response time definition containing the components of Reflex Time.(2)

These references are primarily concerned with Reflex Time for fire incidents, yet, the concept is just (or more) important for emergency medical incidents. References to Reflex Time are not as prevalent in the literature, however.

The individual components of Reflex Time are defined and discussed within the two categories: (1) time indirectly manageable, and (2) time directly manageable by the City of Paso Robles (refer to Figures 3-1 and 3-2).

TIME INDIRECTLY MANAGEABLE

Detection

The period of time from initiation of event until it is discovered by an individual who can contact the City of Paso Robles Dispatch Center. For fire, the initiation of event is ignition, while for a medical incident or accident or from onset of acute symptomatology (in case of heart attacks, strokes, etc.) until the patient or someone else decides to contact the dispatch center.

Obviously, these time periods are dependent upon a large number of variables and are difficult to even estimate -- especially for medical incidents. In structures equipped with an operable smoke detector, an alarm would be given approximately one-half to one minute after ignition.(3)

There have been studies of the time period from onset of acute symptomatology to call for emergency medical services.(4) This time period appears to vary significantly with symptomatology; however, a general study of over 3,000 patients indicates that approximately 50% have emergency medical help requested within 5.5 minutes.(5) Average reporting times for patients with life critical symptoms (e.g., cardiac arrest or life threatening

arrhythmia) could not be identified. It is assumed that the time period for detection of an EMS incident is one minute. Bergner, et al., used an assumed value of one minute for their study.(6) This time estimate considers both delayed detection (i.e., an unwitnessed arrest), as well as, immediate detection by the patient or bystander.

Report of Alarm

The period of time from discovery of a fire/emergency medical incident until it is reported to the dispatch center. This period is also difficult to estimate because of a large number of variables, such as access to a telephone and attempts to handle a situation prior to calling the dispatch center (i.e., a delayed alarm). In the absence of any definitive estimates of this time period, it seems reasonable to assume that, once discovered, a fire or emergency medical incident would be reported in one to two minutes.

TIME DIRECTLY MANAGEABLE

Dispatch of Units

This component is the interval between the time a call is received by the Dispatch Center and responding units are notified. Functions which have to be performed during this time period are: receiving the call, determining the nature of the request for service, identifying the appropriate available response, and alerting the corresponding units.

The current average dispatch time for the City of Paso Robles fire/rescue services is estimated to be 2 minutes and 12 seconds.

Turnout Time

This time period begins with the receipt of an alarm at a station and ends when the fire/rescue vehicle leaves the station. (Units which are "on the air and available" generally are not associated with a turnout time). It is difficult to estimate this time due to the manner in which the Paso Robles Fire Department is organized, i.e., heavy use of volunteer firefighters who must respond from various locations and distances. An analysis of the dispatch data provided indicates that the current average turnout time for all responses is one minute and 42 seconds. This is based upon Hunt Research Corporation experience which has shown that actual on-road response times generally approximate 5 minutes. The data provided indicates that for 30 averaged incidents, the Paso Robles Fire Department response time, including turnout time, averaged 6 minutes and 42 seconds.

Travel Time

This period is the time required for the unit to drive to the scene of the incident. Travel time is generally a function of distance, road and traffic conditions, time of day, etc. Studies have shown that, on an overall basis, travel times are relatively constant; e.g., "The results of the New York Experiment and elsewhere show little or no difference in travel velocities at different times of day, perhaps because less traffic congestion is offset by poorer visibility at night".(7)

A study of City of Paso Robles fire/rescue responses in 1989 produced a calculated average first due company response time of 6.66 minutes, including turnout. The shortest and longest response times for first due units ranged from 2.0 minutes to 22.0 minutes, respectively.(8)

Setup Time

This component is the period of time from arrival on scene until suppression or medical treatment activities are initiated. Activities within this period are: dismounting, unloading equipment, gaining access to the structure, sizing up the incident, and taking action. National estimates of setup time (for a one or two story structure) range from 1-3 minutes, and one-half to one minute for EMS incidents.

RECOMMENDATION 3-1

The City of El Paso de Robles approve the use of "Reflex Time" as the definition of "Response Time".

3.2 Reflex Time Issues

There is complete agreement in the literature and among fire protection/emergency medical experts concerning the need to minimize response time in order to protect life and property. For example, "Tests carried out by the Los Angeles City Fire Department and other agencies demonstrate conclusively that a delay in the application of fire suppression agents significantly increases the amount of water and time required to control a fire."(9)

Response time is also critical for provision of emergency medical services. Common sense, as well as, numerous studies (10-11) have substantiated the requirement for rapid initiation of life support services (airway maintenance, bleeding control, CPR and shock prevention and control). For example, a report by the Los Angeles County Fire Department states: "Another study conducted by the American Heart Association showed that the amount of time to initiation of basic life support was critical to overall survival rate."(12) A recent study has demonstrated that advanced life support care is also critical to overall survival.

Specific time requirements are specified in the American Academy of Orthopedic Surgeon's classic textbook on basic life support care: "There must be a maximal sense of urgency in starting basic life support. Time is critical. If the brain is deprived of oxygen for four to six minutes, brain damage is likely to occur. After six minutes without oxygen, brain damage is extremely likely."(13)

Thus, there is no question that it is important to minimize fire and emergency medical Reflex Time, but to what levels and at what cost? Unit travel times could be significantly reduced by building a fire station on each corner; however, our society would not pay for such a level of service. What, then, is the appropriate balance of service level and cost?

A review of Figures 3-1 and 3-2 shows that the development of a fire/emergency medical incident can be considered a continuum from initiation to conclusion. And, it has been established that emergency services should be provided as early on the continuum as possible, considering that "appropriate balance." For the City of Paso Robles, it is recommended that this "balance" be established by basing the Reflex Time standards on the most critical events in the development of a fire or life safety incident.

For fire, the recommended critical event is "flashover." The recommended emergency medical incident is the time after a cardiac arrest at which the chance of recovery falls below 50%.

Flashover

Flashover is defined as, " ... the point at which fire gases and all combustible surfaces of a room blast into flame at once."(14)

Deaths, injuries and property loss can be expected to increase significantly after flashover has occurred. In addition, the fire department resources needed to extinguish the fire increase greatly after flashover.

Thus fire suppression initiated prior to flashover will generally require fewer resources, and will provide greater protection of life and property.

Emergency Medical Resuscitation Rate

The emergency medical critical event is the 50% probability of resuscitation following a cardiac arrest -- that is, to initiate CPR prior to the point on the continuum where the probability of resuscitation drops below the 50% level. The chart presented in Figure 3-2 based on American Red Cross data, illustrates the point that each minute beyond four minutes reduces the chance of recovery by 50%(15)

The City of Paso Robles Fire Department, of course responds to many types of medical incidents other than cardiac arrests. In fact, the Department during 1989 responded to 363 incidents classified as "Medical Aids." However, this critical event was selected because it is the single most frequent cause of death preventable by rapid application of both basic and advanced life support skills. Moreover, other medical incidents such as asphyxiation, drowning, Sudden Infant Death Syndrome, drug overdose and other respiratory failures also require rapid intervention and cardiopulmonary resuscitation. In 1989 Medical Aid incidents represented 40% of the total number of incidents responded to by the Fire department.

3.3 Recommended Fire Reflex Time Standard

RECOMMENDATION 3-2

The recommended fire protection Reflex Time standard for the City of El Paso de Robles is to "initiate fire suppression actions prior to flashover."

This standard means that for buildings without automatic fire suppression systems, the first due unit should be on-scene and applying an extinguishing agent prior to the occurrence of flashover.

The implementation of this standard requires a definition of when (on the continuum) flashover can be expected to occur. Like many other factors associated with the provision of fire/rescue services, flashover is a complex phenomenon, and the time to flashover can vary significantly based upon materials and furnishings, source of heat of ignition, available oxygen, use of accelerant, etc.

"Flashover is now believed to be caused by thermal radiation feedback from the ceiling and upper walls which have been heated by the fire. This radiation feedback generally heats the contents of the fire area. When all the combustibles in the space have become heated to their ignition temperatures, simultaneous ignition occurs."(16)

Toxic product-of-combustion levels are vary important to life safety. The Operation San Francisco tests showed that the carbon monoxide level of 3,000 ppm was exceeded approximately 8 minutes after ignition, with 5,000 ppm exceeded shortly thereafter. Because a person can survive for only 3-5 minutes in an atmosphere with levels above 5,000 ppm, it is felt that protection for occupants from toxic products will generally have to come from automatic detection and suppression systems.(17)

The literature contains a number of average times to flashover: "10-15 minutes"(18); "11-12 minutes"(19); "9

minutes"(20). In addition, actual times to flashover, as measured in full scale fire tests, are also given: for example, 6 minutes 26 seconds, 7 minutes and 17 seconds.(21)

RECOMMENDATION 3-3

It is recommended that fire suppression actions be initiated within 9 minutes for at least 90% of all fire incidents and 95% within 10 minutes.

This recommendation is based upon the fact that 9 minutes is the average of the frequently-quoted range of 6-12 minutes. The 90% and 95% accomplishment levels are suggested because it is not reasonable to expect that the standard can be met in every case.

Comparison With Current Estimated or Average Times

The portion of the Fire Reflex Time directly manageable by the City of Paso Robles is estimated using current averages (presented in Section 3.1) and summarized in Table 3-1. (Note that the time directly manageable is the total Reflex Time minus the detection and reporting components.)

TABLE 3-1

Estimated Current Average Components

of Fire Reflex Time

Directly Manageable by the City of Paso Robles

Component	Current Average (Minutes)
Dispatch of Unit	2.2
Turnout Time	1.6
Travel Time	5.0
Setup Time (National Average)	1.5
	10.3
	+ 3
	13.3

Using these figures leaves **no time** for the detection and reporting functions -- best case estimate of 3 minutes. Moreover these figures are averages, if, for example, the maximum reported response time were used (22 minutes) the Reflex Time period would be 25.1 minutes.

Reduction of Fire Reflex Time

The various components of Reflex Time offer a number of opportunities for the City of Paso Robles to keep this time period within the standard. Even the components which are only indirectly manageable (detection and reporting), can be reduced.

Perhaps the single most important action the City can take to meet the Reflex Time standard is to require and/or encourage the installation of automatic detection and suppression systems in new and identified existing structures. This action will increase the level of protection of life and property from fire and reduce long-term costs for provision of fire suppression services. **Thus, it is the most cost-effective approach to meeting the Fire Reflex Time standard.(22)**

Numerous studies have proven the tremendous value of automatic systems; for example:

A study of 117 fires showed that "... there might have been approximately a 90 per cent reduction in both lives lost and injuries sustained if fire protection systems had been installed. Also, property loss would have been decreased by a factor of about three with the detector system, by a factor of about seven with a suppression system."**(23)**

"A community policy to control and reduce property hazards by requiring automatic sprinklers can have a significant impact on holding the line with fire department staffing requirements. In addition to improved life safety and property protection, automatic sprinklers may reduce fire insurance premiums and the demand on the community's fire suppression delivery system. This may open new delivery service options, such as improvements of emergency medical services."**(24)**

An analysis of fires in U.S. Department of Energy sprinklered facilities resulted in the following conclusions:**(25)**

(a) The loss in sprinklered buildings is only 20% of the loss in unsprinklered buildings; only low potential loss buildings are not sprinklered.

(b) There has been no loss of life in a sprinklered building due to fire.

(c) Sprinklers have been 98% effective in controlling fires.

(d) Approximately 1/3 of the sprinklered building fires were extinguished by the operation of only one sprinkler head.

(e) The probability of a sprinkler head failing is approximately one chance in one million per year.

(f) The damage resulting from the presence of a sprinkler system is less than 1% of the fire damage that would have resulted if the sprinkler system had not been present.

Detection

Rapid fire detection is critical to meet the Reflex Time standard. The estimate of current Reflex Time was based on a detection time which assumed the presence of an operable smoke detector. But, what about those structures in the City of Paso Robles which currently do not have operable smoke detectors or other automatic detection or suppression devices?

Smoke detectors are not only proven life savers but can also significantly reduce fire losses, for example:

"Knockdown time and loss would go down dramatically if the alarm were given when open flame first appeared. If, through the use of such warning systems as smoke detectors or sprinklers the alarms were received six minutes earlier and the company present on the scene six minutes sooner, flashover might not have occurred and loss might be reduced to approximately half the loss anticipated if the first-in company arrives at flashover."(26) It is recommended that the City of Paso Robles continue to emphasize the importance of early fire detection and warning systems.

Reporting

There is little that the City of Paso Robles can do to further reduce reporting time except through public education and the increased use of automatic reporting systems. For example, public education programs could be used to teach residents (especially children) to call 911 immediately, rather than trying to fight the fire first and then calling. The City has enhanced 911 presently, which is considered to reduce reporting time.(27) It is also extremely important, especially with a developing and expanding City, as is the case with the City of Paso Robles, that installation of sufficient public telephones occur as development occurs. A good public telephone system in conjunction with private telephones can provide significant benefits in reducing reporting time, especially in reporting those types of incidents which occur outside of a structure or the normal familiar outside environment, e.g., parks, recreational areas, public facilities.

Dispatch of Units

As stated earlier, the current average fire/rescue dispatch time is approximately 2 1/2 minutes. However, this time period is associated with a manual dispatch system. It is the understanding by Hunt Research Corporation that the City may be considering the relocation of present dispatch facilities, currently located at the Paso Robles Police Department, to a new Police facility which would

be constructed some time in the future. At this time the City should seriously consider acquiring a computer-assisted dispatch (CAD) system, which should significantly reduce the average dispatch time.

Estimates of an average dispatch time under a new computer-assisted system are not available. However, it is the experience of Hunt Research Corporation that properly-designed CAD systems can process a dispatch as fast as the information is obtained from the calling party; that is, after the call is received, obtaining the information concerning the incident becomes the determining factor in dispatch time.

The average time generally required to pre-screen a 911 call and transfer it to a dispatcher is reported to be in the range of approximately 15-20 seconds.

If 30-45 seconds are required to obtain the incident information (a reasonable average based upon HRC experience), then the average dispatch time with a CAD system should be between 45-60 seconds. A one-minute average dispatch time would represent a 1.2 minute (45%) reduction compared to the current average time of 2.2 minutes.

A one-minute dispatch time would reduce the estimated average Reflex Time (directly manageable by the City of Paso Robles) presented in Table 3-1 from 10.3 to 9.1 minutes, a 12% reduction.

Thus, dispatch time is an area in which the City of Paso Robles can make a significant reduction in overall Fire Reflex Time on a cost-effective basis.

Turnout Time

Average turnout time for City of Paso Robles fire/rescue units was calculated to be approximately 1.6 minutes. Under the current system for delivery of services this time can be considered good; especially considering that units cannot generally respond until volunteer personnel are called and arrive at their designated stations. Probably the best average turnout time that could be achieved is between .45 and 1.0 minutes with personnel in quarters. Using 1.0 minutes as an average turnout would result in a 42 second (38%) reduction in the currently estimated turnout time of 1.6 minutes. This is another are directly manageable by the City of Paso Robles were a significant reduction in the overall Fire Reflex Time can be accomplished.

Travel Time

In general, the only way to reduce travel time is to relocate and /or add fire stations. This topic will be specifically addressed in Section IV of this report.

Setup Time

The time required for setup can often be reduced through improved procedures, training and use of additional personnel. Definitive data for average setup time s for the City of Paso Robles fire companies were not available; therefore a recommended goal for this period is 1.5 minutes (National average). However, it must also be recognized that setup time is highly dependent upon the fireground environment -- for example, a fire in a multi-story structure will generally take more time that an incident involving a single story structure. However, and as stated above, the goal represents a National average and therefore provides a basis for City of Paso Robles Fire Department operations and not necessarily what has to represent setup time for the City. It would be expected that the Department would work towards identifying ways of further reducing this time.

3.4 Recommended Emergency Medical Reflex Time Standard

RECOMMENDATION 3-4

The recommended emergency medical Reflex Time standard for the City of El Paso de Robles is to initiate emergency medical assistance within 8 minutes of occurrence of life critical symptoms for 90% of incidents, with a maximum Reflex Time of 10 minutes for 95% of the responses.

Definitive emergency medical assistance includes: establishing an airway, medication and defibrillation. This standard is based on studies which indicate that definitive medical assistance for cardiac arrest provided within this time period, together with CPR initiation within 4 minutes, will result in a successful resuscitation in over 40% of the cases.(28)

These studies show that there is a decrease in cardiac arrest outcomes as measured by patient discharges from hospitals when definitive care exceeds a one minute response. The percentage of patients discharged from hospitals drops from 43% down to 22% when definitive care is delayed from a 6 to 8 minute range to a range of 8 to 10 minutes. When the time to definitive care exceeds 10 minutes, the percentage of patients discharged from hospitals falls below 17%(29)

Figure 3-3 shows that even when CPR is initiated within 4 minutes of cardiac failure and definitive care within 8 minutes, only 40% of patients will be discharged from the hospital.

Arguably, the closest emergency medical equivalent to flashover is the function of time to initiate cardiopulmonary resuscitation in a cardiac arrest incident. HRC established a response time limit as the time to initiate cardiopulmonary resuscitation prior to the point that the probability of

Percentage Cardiac Patients Discharged
vs.
Time to CPR and Definitive Care

		Time until Definitive Care Started	
		Less than 8 Min	More than 8 Min
Time until CPR Started	Less than 4 Min	40%	17%
	More than 4 Min	27%	10%

Source: Bergner, et. al., Evaluation of Paramedic Services for Cardiac Arrest

FIGURE 3-3

resuscitation drops below 50%. Based on American Heart Association data, Figure 3-2 illustrates the importance of starting CPR within the first four minutes following the victims collapse due to cardiac arrest.

While there can be little doubt about the importance of the four-minute time frame for the initiation of CPR in cardiac arrest incidents, achieving it in 90% of the incidents may or may not be feasible at this time due to the present Department operational configuration. It may be that a lower initial compliance factor, such as 75% to 80%, be established leading to a phased-in approach towards reaching the 90% level over a period of years.

Comparison With Current Estimated or Average Time

Estimates of the portion of the emergency medical Reflex Time directly manageable by the City of Paso Robles, using the data presented in Section 3.1, are summarized in Table 3-2.

TABLE 3-2

Estimated Current Average Components

of Emergency Medical Reflex Time Directly Manageable

by The City of El Paso de Robles

Dispatch of Units	2.2 minutes
Turnout Time	1.6 minutes
Travel Time	5.0 minutes
Setup Time (National average)	1.0 minutes
	9.8 minutes

The average times listed in Table 3-2 show that the Reflex Time standard has already been exceeded, even without the addition of the time required for detection and reporting.

Reduction of Emergency Medical Reflex Time

Because the estimated current emergency medical Reflex Time exceeds the recommended standard, it is important to examine all of the components which make up the standard.

As was the case with fire (i.e., use of automatic detection and suppression systems), there is a single most important action

which the City of Paso Robles can take to improve life safety. This action is to conduct citizen training in cardiopulmonary resuscitation (CPR) designed to reduce the time to initiation of CPR.

Detection

Unfortunately, there is not a device for emergency medical incidents which is analogous to the smoke detector. There are a few promising devices that may one day offer high risk cardiac patients a reliable mechanism to detect the onset of potentially life-threatening arrythmia; however a single device to detect life threatening emergency medical conditions shows no sign of becoming available in the near future. Therefore, detection is almost entirely up to the patient and/or bystander, and the City of Paso Robles can do little to reduce detection times, except for public education.

Reporting

Direct-line (or automatic dialer) emergency medical reporting systems are presently available, (although the direct dialer has been legislatively banned in numerous jurisdictions), but generally are used only by persons with a high risk medical history. As with fire reporting, there is probably little that the City can do to further reduce reporting time for the general population.

Dispatch

The discussion of the need for the CAD system (see Section 3.3) is also applicable to emergency medical Reflex Time.

Turnout and Travel Time

These Reflex Time components are generally the same as those for fire incidents.

Setup Time

Typical emergency medical setup time for definitive patient care is on the order of 45 to 60 seconds; which offers minimal opportunity for significant reductions.

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SECTION IV

APPARATUS/PERSONNEL

LOCATION and ASSIGNMENT STANDARDS

4.1 Recommended Apparatus/Personnel Assignment Standards

These standards are concerned with the kind and number of apparatus and personnel (fire suppression and rescue units) that should respond to fire and rescue incidents. Such standards are used by every fire department (although not necessarily called "standards"), and generally specify the number and type of companies required, as well as the total number of personnel needed on the fireground.

Some fire departments establish these incident assignment standards for various alarm levels (first alarm, second alarm, etc.) although the trend is to define full first alarm assignment with additional resources on an individual basis.

Standards for first alarm assignment are, of course, a function of the characteristic of fire hazards in the community. However, general guidelines and criteria for establishing these standards are prevalent in fire service literature. For example:

High Hazard Occupancies

4 engines, 2 trucks, and 2 chief officers with a total of 26 personnel

Moderate Hazard Occupancies

3 engines, 1 truck, and 1 chief officer with a total of 17 personnel

Light Hazard Occupancies

2 engines, 1 truck, and 1 chief officer with a total of 13 personnel(1)

Similar criteria are presented in numerous other documents, and it is understood that they are generally based on fire flow requirements. "Fire flow" is defined as the estimated water delivery rate in gallons per minute required to provide adequate fire protection for a specified structure.(2)

Fire flow requirements for a structure are calculated using a formula which is based on 1,450 actual fire flows as plotted with respect to total building floor area.(3)

The formula takes into account the following factors:(4)

(a) Effective floor area (considering potential for firespread).

(b) Type of construction.

(c) Building use (fuel loading - what there is in the building to burn).

(d) Exposures (surrounding structures).

(e) Combustible/non-combustible roofing materials.

(f) Presence of automatic suppression systems.

It is felt that the fire flow estimate is the best currently available quantitative measure of the fire suppression capability required for specific buildings. The formula can be used for all structures except very high hazard occupancies, such as lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants.(5)

When a fire flow requirement has been calculated, then the resources required to deliver that fire flow can be determined. The results of a number of studies have been used to establish the relationship between fire flow and corresponding resources (engine and truck companies).(6)

There is little controversy concerning the fire flow defined resource requirements, especially compared to the controversy involving response time and company staffing level criteria. The primary issue which is debated is the need to dispatch a full first alarm assignment; for example, "A full response is needed only a small percentage of the time (e.g., 2 or 3 percent). One could argue, therefore, that a small initial response should be sent since it will be adequate such a high percentage of the time. However, it is those few times that a full response is needed and that a quick and complete response by the fire department may save lives and property."(7)

4.2 Recommended Fire Suppression Standards

The approach to setting fire incident assignment standards is to establish standards defining the:

"full first alarm assignment based on the resources required to control a fully-involved structure fire" (i.e., an entire building or the area between four hour fire walls, whichever is smaller).

These standards should generally be established by "type" of fire department response district. The type represents the magnitude of the fire risk (what there is to burn) in the district, and permits the establishment of first alarm assignments that are related to the expected demand for fire suppression resources.

It is recommended that base level city-wide standards be established for all engine company response districts that have a relatively light fire hazard level, defined as follows: less than 50% of the unsprinklered occupancies have a fire flow requirement of more than 1,000 gpm, <u>and</u> there are no high life risk facilities.

In this type of response district, the recommended first alarm assignment is:

RECOMMENDATION 4-1

A minimum of 9 firefighters (including a minimum of 2 engines, 1 BLS rescue unit, and a duty Chief Officer) and meet the 9-minute (Reflex Time) standard in 90% of dispatches and a 10-minute (Reflex Time) standard in 95% of the incidents.

This base assignment standard should provide adequate protection for typical fires in structures having total floor areas ranging from 4,000 sq. ft. (high hazard) to 10,000 sq. ft. (low hazard).(8) Of course it is always possible to create fire demands in those structures which exceed the 1,000 gpm fire flow capability, for example, arson fires involving accelerants and delayed alarms. However, the cost of providing the resources required for such situations within the stated Reflex Time is generally not considered cost-effective. Thus, the base standard provides protection for single-family residential neighborhoods, small apartment houses, neighborhood shopping centers, etc.

Standards for the "moderate" class of response district should be used for those areas in which over 50% of the unsprinklered occupancies have a fire flow requirement over 1,000 gpm but less than 2,500 gpm. These districts represent moderate fire protection risks, and will generally be found in the downtown areas, but may exist or be developed in the future within the City of Paso Robles, e.g., new annexations, Paso Robles Airport etc.

In this class of response district, the recommended first alarm assignment is:

RECOMMENDATION 4-2

A minimum of 15 firefighters (including a minimum of 3 engines, 1 BLS rescue unit and a duty Chief Officer) meeting the 9-minute (Reflex Time) in 90% of dispatches and a 10-minute (Reflex Time) in 95% of the incidents.

The moderate assignment should provide adequate protection for

typical fires in structures having total floor areas ranging from 10,000 sq. ft. (high hazard) to 60,000 sq. ft. (low hazard).(9) Examples of such occupancies include large apartment complexes, stores, medium-size office buildings, commercial manufacturing plants, etc. It should also be noted that adoption of this recommendation should not cause the total depletion of fire resources since it is assumed that the "volunteers" would be recalled to assist either at the fire or to staff vacant fire stations.

It is recommended that occupancies having a fire flow requirement in excess of 2,500 gpm, high rise, high life risks (hospitals, nursing homes, schools) hazardous materials facilities be considered target hazards and be prefire planned on an individual basis -- that is, that the first alarm assignment be established as necessary to meet the special requirements associated with these high risk hazards.

There is a general consensus among fire service officials that the requirement for personnel on scene is more important than the exact mix of companies (beyond what is specified in the standards) that are used to get them to the fire ground. This view is substantiated by a statement in Fire Attack I: "in view of the vast majority of instances, the gallons per minute that can be applied on a fire within a stipulated time after arrival of the apparatus depends upon the available manpower, rather than rated pumping capacity".(10) It should be noted that the current fire station configuration within the City of Paso Robles does not appear to satisfy the fire flow pumping requirements anticipated for the City at build-out.

The light and moderate first alarm assignments listed above include a BLS rescue unit with two firefighters staffing the unit. This standard is based upon:

- (a) Two qualified firefighters contribute the personnel resources required to meet the recommendation.

  (b) The availability of emergency medical personnel on the fireground are invaluable for rescue and treatment of injured civilians and firefighters.

  (c) The use of BLS trained firefighters satisfies both of the above addressed needs.

RECOMMENDATION 4-3

That at least one Fire Department BLS Rescue unit, staffed by two firefighters, be automatically included in the dispatch for all structure fires occurring within the City of El Paso de Robles.

4.3 Recommended EMS Standards

At the present time the manner in which EMS services are delivered by the Paso Robles Fire department is through a dispatch procedure which allows dispatchers to make the choice as to whether or not dispatch a fire unit is dispatched. This is often referred to as "selective dispatching" and in a number of instances (other City's) has lead to a great deal of negative criticism including the investigation of the manner in which dispatch services are delivered. Generally, Fire Department EMS services are handled by one career on duty firefighter, dispatched at the discretion of the dispatch center, in support of the local ambulance provider. In view of the level of service being provided the following recommendation is made:

RECOMMENDATION 4-4

That the City of El Paso de Robles support a Fire Department program to provide 24 hour Basic Life Support Services within the City.

As a result of the general location of most fire stations, e.g., generally located in or adjacent to populated areas of the City, the Fire Department is looked upon as the first-responder in most California communities. Whether providing Basic or Advanced Life Support services is not necessarily the question, what is more important is a response time that meets appropriate Reflex Time requirements. A two tiered approach, Private/Public sector i.e., private ambulance provider/Fire Department provides a well rounded approach to most communities emergency medical needs and is the type of system used in the majority of California cities. HRC team members feel that this approach towards the delivery of EMS within the City of Paso Robles is the preferred method and would be accomplished through the use of all engine companies and a "Rescue Squad" assigned to Fire Station #1, (Main).

4.4 Staffing Issues

The determination of minimum recommended staffing levels for fire service/EMS units is probably the single most controversial issue in the fire service -- especially for engine and truck companies. This issue can best be defined by the question:

"What is the minimum number of personnel required to safely perform the associated functions of protecting life and property?"

Note that there are two fundamental factors to be considered in addressing this question:

(1) Saving lives, reducing injuries, and protecting property of the community's residents; and

(2) Performing this service safely; that is, without unwarranted endangering of fire/EMS personnel.

There are no definitive answers to the staffing question -- at least, answers that are generally accepted. The following citations substantiate this conclusion:

In the final sense, the decisions related to manpower levels (and reductions) are made by politicians. In cases where manpower is reduced gradually, the City does not summarily or suddenly burn down. Statements like "we must have four on an engine and five on a truck" cannot be backed up by logic because nobody knows what the optimal staffing of a work unit should be. Modern fire chiefs must work aggressively in the system to develop and manage fire force levels that balance cost and benefits."(11)

"A number of authors have recommended staffing levels for fire companies ... but there has been no research relating to this issue. The more personnel assigned to each company, the better its performance when it reaches the scene. But, assigning more personnel to each company means fewer companies and therefore longer response times. In evaluating the question of how many personnel to assign, one must consider not only fireground performance, but also the effect on response time. Research is needed on the staffing question, an issue ranked high by our panel of experts."(12)

In the absence of generally accepted staffing standards, fire departments frequently used the Insurance Services Office (ISO) Grading Schedule(13) as a justification for fire company staffing. The Schedule, however, was developed for insurance rate-setting purposes, and not as a fire department standard. Over the past decade, the use of the Grading Schedule as a basis for fire department planning has declined significantly. In addition, the ISO has revised its policies concerning the use of the Schedule. For example, surveying of cities of 500,000 or more has been discontinued. The rate setting process for these cities was changed to an actuarial basis, and the Schedule was reduced in Scope. The current Grading Schedule is limited to evaluation of ability to control fires in small to moderate-size structures which require less than 3,500 gpm fire flow.

A comprehensive nationwide survey of fire suppression company staffing was conducted in 1982, which included a question pertaining to the criteria used by each department to establish staffing levels. Respondents stated that "budget considerations, personnel safety and departmental operations or tactical policy were among the most important criteria in determining their department's current suppression crew sizes." It was interesting to note that most of the respondents also reported that "OSHA, mutual assistance, national studies, and NFPA recommendations had not been important criteria in determining existing crew size."(14) Tables 4-1 and 4-2, following, provide a comparison of comparable

City's fire department present staffing standards. The comparison is based upon current and projected populations and should only be used to illustrate the variance that exists today in staffing patterns.

TABLE 4-1

Fire Department Staffing Levels of City's Closest in Size (Population) to The City of El Paso de Robles (16,392)(15)

City	Minimum # Personnel Per. Engine Co.	Minimum Daily Staffing	Stations	Volunteers
Milbrae	2	6	2	No
Banning	3	5	2	Yes
Albany	2	6	1	No
Paso Robles	--	3	3	Yes
Santa Fe Springs	3	17	4	Yes
Solana Beach	3	6	1	No

TABLE 4-2

Comparison of Staffing Levels of City's Closest in Size (Population) to The City of El Paso de Robles at Build-out (41,000)(16)

City	Minimum # Personnel Per. Engine Co.	Minimum Daily Staffing	Stations	Volunteers
Covina	3	12	3	No
Los Altos	2-3	11	3	Yes
Poway	3	6	2	Yes
Paso Robles	--	--	--	Yes
S.L.O.	2	12	4	No
Roseville	3	14	4	No
Newark	3	11	3	No

Various fire protection publications list recommended staffing levels, such as:

Fire Attack II(17)

Municipal Fire Administration(18)

Training Standard on Initial Attack(19)

Urban Guide for Fire Prevention and Control Master Planning (total personnel requirements based on fire flow)(20)

In general, such recommendations are either based on the ISO Grading Schedule, or are not quantitatively substantiated.

Individual local governments have attempted to establish their own suppression staffing standards, notably, West Allis/West Milwaukee, Wisconsin,(21) Dallas,(22)(23) Seattle,(24) and Los Angeles.(25) The Dallas studies are probably the most frequently

referenced and are based on the total time required to complete a defined evolution. The Los Angeles City Fire Department used normalized activities to compare the effectiveness of different staffing levels.

An Executive Development III Research Project for the National Fire Academy produced a comparison of the results of the Wisconsin, Los Angeles, Seattle and the first Dallas studies.(26) These results were converted to a common measure of effectiveness for a given staffing level. This measure relates the time to achieve a specific objective or group of objectives. The shortest time required for a set of evolutions is normalized to the value of 1.0. Table 4-3 contains the results of this comparison.

TABLE 4-3

Comparison of Results of Staffing Studies

Staffing Level	Wisconsin	Dallas	Los Angeles	Seattle
6	--	--	--	1.0
5	1.0	1.0	1.0	0.79
4	0.73	0.59	0.75	0.49
3	0.65	0.34	0.46	0.45

The authors conclude that there is a very strong positive correlation among these results and state that, "Despite the variation in method, technology, and reporting method, all tests indicate that increased staffing increases engine company capability."(27)

Such studies still do not address the question of the cost-effectiveness of alternative staffing levels, or of fire protection programs, i.e., the issue of investing resources in public education, fire prevention, built-in detection and suppression systems.

Thus, each community must establish its own level of suppression capability based on a combination of factors such as:

(a) Budget Limitations.

(b) Employee Agreements.

(c) Community Fire Risk.

(d) Total number of companies available (i.e., higher staffing vs fewer companies, or fewer companies vs higher staffing).

(e) ISO, NFPA, or other criteria.

The result of suppression crew size decision-making is that crew sizes from one to eight firefighters(28) can be found on comparable apparatus -- with some correlation with community size, but not necessarily with fire load.(29)

Rescue Unit Staffing

The issue of staffing levels for emergency medical units (BLS) is not as controversial nor as extensively discussed in publications as that of firefighting units. However, nationally accepted staffing standards also do not exist. For the most part, communities establish their own emergency medical staffing standards (frequently based on state or county health department requirements) which are generally set at the following level:

BLS - 2 persons (usually EMT-A, EMT-1*, EMT-D)

* City of Paso Robles Fire Department standard.

It is felt that the reason for this consistency in staffing is that standard emergency medical functions are relatively easy to define; at least as compared to engine or truck company functions -- that is, there is general agreement that two properly trained emergency medical technicians are required to perform specific life-critical functions, etc.

4.5 Approach to Setting Minimum Fire/EMS Apparatus Staffing Standards

Considering the scope and limited schedule associated with this project and the demonstrated difficulty in setting rigorous quantitative staffing standards, it is recommended that staffing standards for engine, ladder truck, and rescue units be based on:

(1) The minimum number of personnel required to safely perform a basic function critical to the protection of life and property.

For structural fire incidents, this basic function will vary by the level of risk, i.e., type of occupancy, the total number of personnel and apparatus. The emergency medical functions described will be for Basic Life Support (BLS).

The following recommended approach is a result of a review of current and anticipated Department operational demands. The established functions to be used in deriving the staffing

standards:

FIRE SUPPRESSION

Engine Function

Moderate:	Enter a smoke-filled commercial building and place two 200 gpm streams into operation with engine operating from a hydrant.
Light:	Enter a smoke filled dwelling unit and place a 200 gpm (minimum) stream into operation with engine operating from a hydrant.

Ladder Truck Function

Moderate:	Aerial to roof of two-story building, commence ventilation.
Light:	Aerial to roof of two-story building, commence ventilation.

The 200 gpm stream capacity is sufficient to control and knock down a fully involved room fire in a typical dwelling. Additionally, a 200 gpm stream is required in order to establish initial exposure protection and/or initial attack, or both, upon a fully involved compartmented fire in a typical commercial occupancy.

Ladder Truck functions generally include ventilation, utilities control, forcible entry, search and rescue, and salvage. However, it is felt that the initial function most critical to reducing life and property loss is ventilation.

4.6 Engine/Truck Function Staffing Standards

Engine Function - Light/Moderate Hazard

Because of the qualification that all functions be accomplished "safely" and because the function specifies that firefighters enter a smoke-filled room, there is no choice but that the minimum staffing be three firefighters. This conclusion is based on Occupational Safety and Health Administration (OSHA) regulations that a two person team is required to enter a toxic atmosphere, and a third safety person must remain outside to call for help if necessary.(30) It turns out that three firefighters are also required from a water delivery standpoint, based on the estimate of 95 gpm delivery capability per firefighter.(31) (Note that this rate may be substantially increased through improved nozzles and 1-3/4" hose). Moreover, two firefighters are required

to maneuver a 1-1/2" or 1-3/4" hose line, which when combined with a pump operator, also results in a three-person (minimum company.(32)

RECOMMENDATION 4-5

First-line engine companies should be staffed with a minimum of three on duty career firefighters or combination of career and volunteer firefighters.

Ladder Truck Function - Light/Moderate Hazard

RECOMMENDATION 4-6

The recommended minimum staffing level for performing the listed truck functions is three firefighters.

Note that the recommended Reflex Time discussed in Section 3 of this report, is assumed to be the same as that of Engines; therefore the full personnel compliment is expected to be on-scene to assist with truck functions as necessary.

The ultimate goal in an effective fire response is to place the required number of personnel at the scene of an incident within a given time period to perform all of the required tasks. With the exception of the first-due unit, the number of personnel arriving per apparatus is less important than the total which arrive, and the quality of incident scene management. Minimum crew size is generally accepted to be three, based upon the need to have two personnel operate together as a team in a hostile environment with one safety person outside.

EMERGENCY MEDICAL SERVICES

Basic Life Support (BLS) Function

Successfully conduct patient assessment, initiate CPR when cardiac arrest has occurred, and assist in preparation of patient transport as rapidly as possible.

4.7 EMS Rescue Unit Staffing Standards

For over a decade, the standard for ambulance staffing has been two EMT-A's. In 1976, the American Medical Association recognized this standard in its guidelines for Developing Emergency Medical Services: "Every ambulance should have at least two registered or certified medical technicians available for on the scene care en route to the hospital."(33) The present standard for the City of Paso Robles is one, on-duty firefighter.

Since the City of Paso Robles has an assumed responsibility for the provision of pre-hospital EMS (BLS), if by nothing more than by virtue of its 341 responses during 1989, staffing at the two EMT-1 level should be viewed as the minimum prudent course for the staffing of this function.

RECOMMENDATION 4-7

That City of El Paso de Robles Fire Department Rescue unit, assigned to Station #1 (Main), be staffed by a minimum of two EMT-1 personnel.

4.8 Comparison With Other Jurisdictions

A nationwide survey of fire suppression crew sizes resulted in a calculated average staffing level of 3.6 firefighters for both engine and truck companies.(34) This report also states that a majority of the responding fire departments (in cities of at least 100,000 population) have engine and truck crews of four or five. This survey also collected data on "minimum crew size" which is defined as the level below which a company is considered too small to operate. Table 4-4 contains the percentages of responding departments which have adopted the corresponding minimum crew sizes.(35)

TABLE 4-4

Reported Minimum Company Crew Size

	Minimum Company Crew Size			
	One	Two	Three	Four
Engine Companies	2%	43%	49%	6%
Truck Companies	11%	31%	40%	15%

Note: Not one department that responded to the survey specified five firefighters as a minimum crew size. About 60% of the respondents would "sometimes" permit an understaffed company to remain in service.(36)

4.9 Comparison with Present City of Paso Robles Fire Department Staffing Levels

In view of the present City of Paso Robles Fire Department organizational alignment, i.e., career/volunteer participation, it is difficult to truly assess what the comparable levels of staffing actually reflect. The only certainty is that one career

firefighter is on duty at all times augmented by a force of approximately 50 volunteers. Two operational policies, OP-4 and OP-10, require minimum staffing of three personnel to rescue and automatic aid incidents. This was the only reference to actual staffing of fire apparatus that the HRC team was able to reference in their investigation of staffing level requirements. Using the ISO value of 3:1, Volunteer=Career, the Fire Department has a "paper" staffing level of approximately 17 personnel plus three career personnel for a total work force of 20 firefighters staffing three (3) fire stations. In actual application, however, all volunteers must either travel to a fire station or the incident scene when notified of an incident, and, there is no assurance that volunteers will even be available or the number that will respond even if available. Therefore, reliability of available response personnel becomes a critical issue.

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SECTION V

RECOMMENDED STANDARDS FOR OPERATIONAL SUPERVISION AND SUPPORT PERSONNEL

5.1 Standards for Supervision and Support Personnel

Field Supervision

Field supervision in the fire service normally involves a combination of management, administrative and incident command duties. Such supervision, to varying degrees, is required in all fire departments.

The number of field supervisors required for a particular situation is usually based upon span-of-control. In general, span-of-control is defined as the number of persons supervised or managed by one individual. For field supervision in the fire service, the definition is tailored to be the number of fire/rescue companies supervised by one individual. These companies may be a combination of engine, truck, rescue, or special purpose units. Because each company is lead by a company officer, the span-of-control can be considered as covering the supervision of these officers.

Field supervision for the City of Paso Robles Fire Department carry the title of Fire Chief and Assistant Fire Chief, but Battalion Chief, Division Chief, District Chief, Captain, and other titles are also used in other jurisdictions. In some cases in may be necessary to require a second level of supervision, that is a Chief Officer to manage the field supervisor. In the case of Paso Robles, this would apply to the Fire Chief since there is no other level of command above the field supervisor who is the Volunteer Assistant Chief. A supervisory staffing level survey for this Report produced the following information:

TABLE 5-1

Comparison of Supervisory Staffing Levels

Cities of Comparable Population(1)

	Second-Line Supervisor	Field Supervisor
Milbrae	Fire Chief	Asst. Chief(1)
Banning	Deputy Chief	Batt. Chief(1)
Albany	Asst. Chief	Asst. Chief(1)
Paso Robles	Fire Chief	Asst. Chief(1)
Santa Fe Springs	Fire Chief	Batt. Chief(4)
Solana Beach	Deputy Chief	Asst. Chief(1)

TABLE 5-2

Comparison of Supervisory Staffing Levels

Comparable Cities at Paso Robles Buildout

(41,000)(2)

	Second-Line Supervisor	Field Supervisor
Covina	Fire Chief	Batt. Chief(4)
Los Altos	Asst. Chief	Batt. Chief(1)
Poway	Fire Chief	Batt. Chief(3)
Paso Robles	--	--
S.L.O.	Fire Chief	Batt. Chief(4)
Roseville	Fire Chief	Asst. Chief(3)
Newark	Fire Chief	Asst. Chief(2)

Field supervisors frequently work shift duty, i.e., one individual for each shift, such that the position is filled 24 hours per day. However, some departments may assign this supervisor to normal business hours, with the individual on call during off hours for incident command. Since the Paso Robles Fire Department, with the exception of three career positions, is essentially "all volunteer", there is no assurance that a Chief Officer will be available to assume command of a field incident.

Another variation used to maximize the use of personnel responsible for field supervision and to assure that a Chief Officer will be available is to assign Administrative duties to these personnel in addition to incident command responsibilities. An example of this system design would be:

(a) Fire Chief - Overall Department Admin./Operations

(b) Fire Marshal* - All Fire Prevention/Public Education

(c) Training Officer* - Department Training and Planning

(d) Volunteer Chief Officer* - Volunteer Program

*Equal Rank below the Fire Chief

RECOMMENDATION 5-1

It is recommended that the field supervision standard providing for management, administration, and incident command functions for Shift Duty Chief Officers permit a maximum span-of-control of 5. That is, a field supervisor be permitted to manage up to five units (engine/truck/rescue units in any combination.

The recommended standard is based on Incident Command (ICS) recommendations as follows:

"The span-of-control of any individual with emergency management responsibility should range from three to seven, with five being established as a general rule of thumb."(3) This recommendation is based upon "safety factors as well as sound judgement planning."(4)

There is almost universal agreement concerning these recommendations in fire/rescue service literature. For example:

"It is general practice to provide a Battalion or District Chief (one for each shift) for each group of eight companies or major fraction."(5)

The span-of-control varies with different organizations; but, whenever supervisors or officers have to provide close and specific support, a span of six is generally considered to be the upper limit."(6)

5.2 Administrative Clerical

The number of administrative/clerical personnel required by each department is, of course, generally determined by the corresponding workload. The workload results from the functions performed by the Department at all levels, i.e., Administration, Operations, Fire Prevention, etc.

The recommended approach for setting a standard for administrative/clerical functions is based on the requirements and expectations placed upon the position. In the case off the Paso Robles Fire Department, considering the diversity of the present and anticipated recommended system design, it is necessary to establish a technique which normalizes the number of staff positions to the number, nature and magnitude of functions being performed. This technique is then used to establish the standard based upon the number of individuals (career and volunteer) within an organization who directly contribute to the administrative and clerical workload.

Thus, the recommended standard:

RECOMMENDATION 5-2

One administrative clerical position should be provided for each five input persons (career and volunteer) and one-half a position provided when the number of input persons is one, or two, then converted to a full-time position when the number of input persons reaches the three level; an additional staff member should be added on/or before the number of input persons reaches seven.

Once again, considering the makeup of the present organization, Hunt Research Team members view the present input load on the present part-time clerical position as being:

- 0 Fire Chief
- o Fire Marshal
- o Fire Engineer

In effect there are three identified input areas, however, it is felt in view of the recommended Department configuration that there is sufficient justification at the present time to convert the present position to a full time position therefore the following recommendation is made:

RECOMMENDATION 5-3

That the City of El Paso de Robles initiate a position classification study to determine the actual workload generated by the three existing input positions and the impact on the present clerical position as a result of recommendations contained in Section 7 of this Report.

SECTION V

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1. **1990 Wage Survey,** The California Fire Service, Vol. I, No. I, January, 1990, pp. 1-16.

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3. **Incident Command Systems,** Fire Protection Publications, Oklahoma State University, Stillwater, OK., 1983, p. 11.

4. Op. Cit., (3).

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SECTION VI

RECOMMENDED STANDARDS FOR FIRE/RESCUE APPARATUS

ASSIGNMENT AND FIRE STATION LOCATIONS

6.1 Rationale for Fire Station Location

The traditional approach to locating fire stations was often a spontaneous response to growth within a community, most likely long after that growth was realized and a need for fire protection identified. In effect, selection of fire station locations was often a "knee jerk" response to a problem, long after the problem was realized and a proper solution identified. The resultant effect of this response is often found today in out-of-position fire stations which are unable to provide adequate response capability and in the possibility that more fire stations may exist within a community than required.

For many years insurance rating organizations required that fire apparatus, i.e., pumpers and ladder trucks, be located within certain specified distances from each other. Depending upon the type of apparatus, often a three-quarter mile radius was required. Travel distances then became the criterion for locating fire stations, and fire response areas within the community were often depicted by large circles on a map describing the various response areas by distance only.

In 1977, the City of Santa Barbara, California, participated in a study which was designed to show the actual relationship between fire department response time and fire buildup to the point of a flashover. Flashover is that point in a fire where the gases ignite simultaneously to create a fire situation generally beyond the capability of first responding fire units to extinguish. The resulting information can now be utilized as the basis for the proper location of fire stations, as well as the adoption of other mitigating factors in an effect to lessen the potential overall effects from fire. Matching fire department response to the flashover curve is referred to today as Reflex Time, and was thoroughly discussed in Section 3 of this Report.

Today, the National Fire Protection Association, 16th Edition(2) identifies several criteria crucial in the selection of proper fire station location. These include:

1- Identification of area to be protected.

2- Topographical features which may inhibit rapid response.

3- Fire experience history for the area to be served.

4- Common-sense approach involving city, insurance officials, and citizen input.

The present day approach to resolving the proper location of a fire station often presents numerous questions and problems which must be addressed before a fire station may be properly located and constructed. In some cases this process may take as long as ten years to accomplish while justifications and planning find their way through the bureaucratic process. Areas such as those listed below, not necessarily in the order indicated, need to be addressed.

1- Previous Fire/EMS History (Justification)

2- Budget Approval

3- Site Selection

4- Site Acquisition

5- Process Review (Planning/Environmental)

6- Architectural Design (Aesthetics/Function)

7- Bid Approval

8- Construction

9- Final Approval

10- Move-In

A problem in any of these areas may result in a significant delay in the length of time it takes to accomplish the project, and under the best of circumstances, may result in at least a ten-year project. Once completed, however, the result should be a location which adequately meets the needs of the community for at least 50 years. As a result of the level of effort required to properly identify appropriate fire station locations, Hunt Research Corporation uses 50 years as the most appropriate functional life for a fire operational facility. Any recommendations contained within this section relative to new construction, relocation or remodeling of existing fire facilities will utilize this consideration. Applying this rationale, the 40th year in the life of a fire station should be used to begin the review process needed to determine the future appropriateness of that particular facility.

A review of Department information provided did not provide any insight into the rationale for the present configuration of fire stations, (Airport excluded), within the City. Without such documentation it is assumed that the previously described rationale

was utilized as the basis for present fire station locations.

RECOMMENDATION 6-1

That any fire station constructed or remodeled be designed, constructed, and maintained to provide an operational life cycle; that is, the station must be designed to meet operational requirements anticipated over a 50 year period, and constructed to structurally last for that period of time.

6.2 Present Fire Station Locations

Today, three separate fire stations, Figure 6-1, housing three engine companies, one rescue unit, an airport crash unit, and several pieces of miscellaneous equipment provide the basis for fire suppression operations within the City of Paso Robles. The actual physical location of the three facilities is described in Table 6-1.

TABLE 6-1

Paso Robles Fire Department

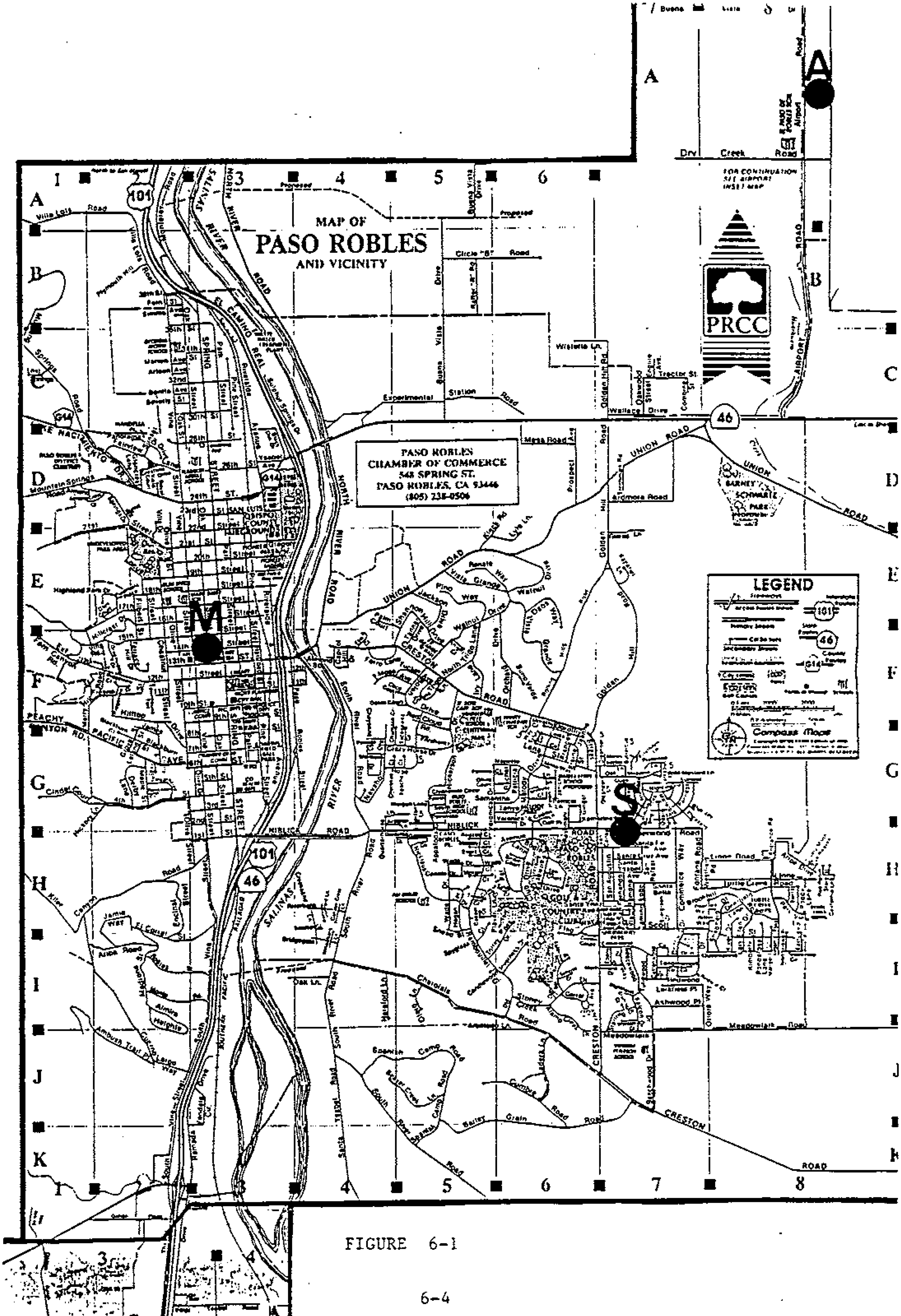
Fire Station Locations

Station #	Location	Date of Construction
1-Main	623 13th Street	1940 era
2-Sherwood	235 Santa Fe Avenue	1950 era
3-Airport	3125 Buena Vista	1983

The "Main" fire station serves as the focal point for all fire department activities serving the Administrative, Fire Prevention and Training needs of the City and Department.

6.3 Recommended Fire Station Locations

Based upon data provided, the calculated average response time for the Fire Department during 1989 was 5 minutes. This time includes response to both fire emergencies and EMS incidents. With Reflex Time used as the basis for measuring all of the components involved in a fire response, Figure 6-1 is used to illustrate the City of Paso Robles Fire Department present fire response capability as measured against the Fire Reflex curve. In view of the excessive response time recorded, Hunt Research Corporation Team members drove and plotted a majority of the response routes within the City on March 30, 1990. Travel distances were recorded at an average calculated speed of 35 miles per hour (national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CHAMBER OF COMMERCE
548 SPRING ST.
PASO ROBLES, CA 93446
(805) 238-0506
PRCC
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FOR CONTINUATION SEE AIRPORT INSET MAP
NORTH RIVER ROAD
UNION ROAD
CRESTON ROAD
NIBLICK ROAD
SPRING STREET
SALINAS RIVER
EL CAMINO REAL
Golden Hill Road
Wallace Drive
Experimental Station Road
Meadowlark Road
Spanish Camp Road
Bailey Grain Road
Airport Road

FIGURE 6-1

FIRE GROWTH vs. REFLEX TIME

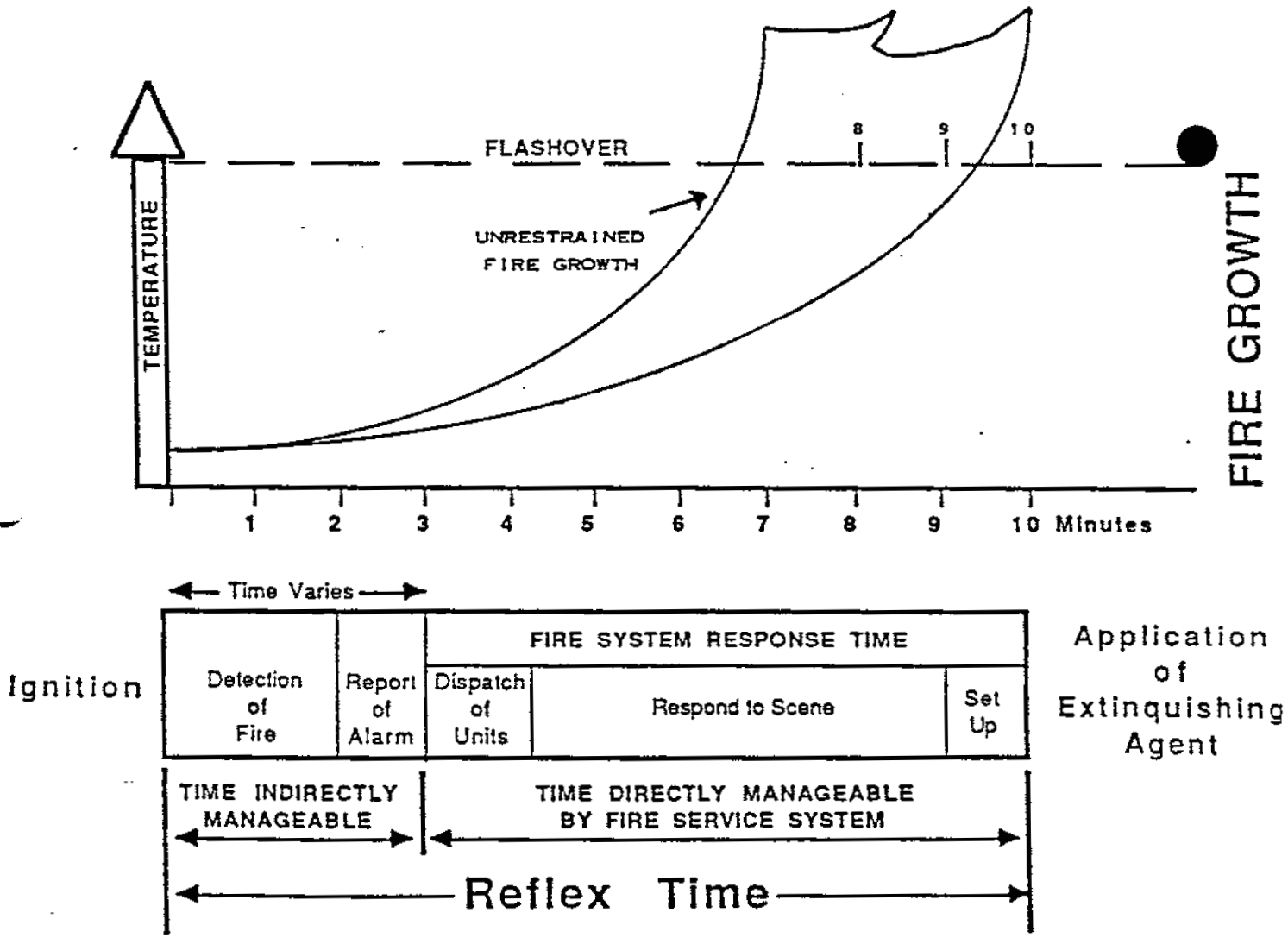


Figure 6-2

1980-1989

Comparison of Station Incident Activity

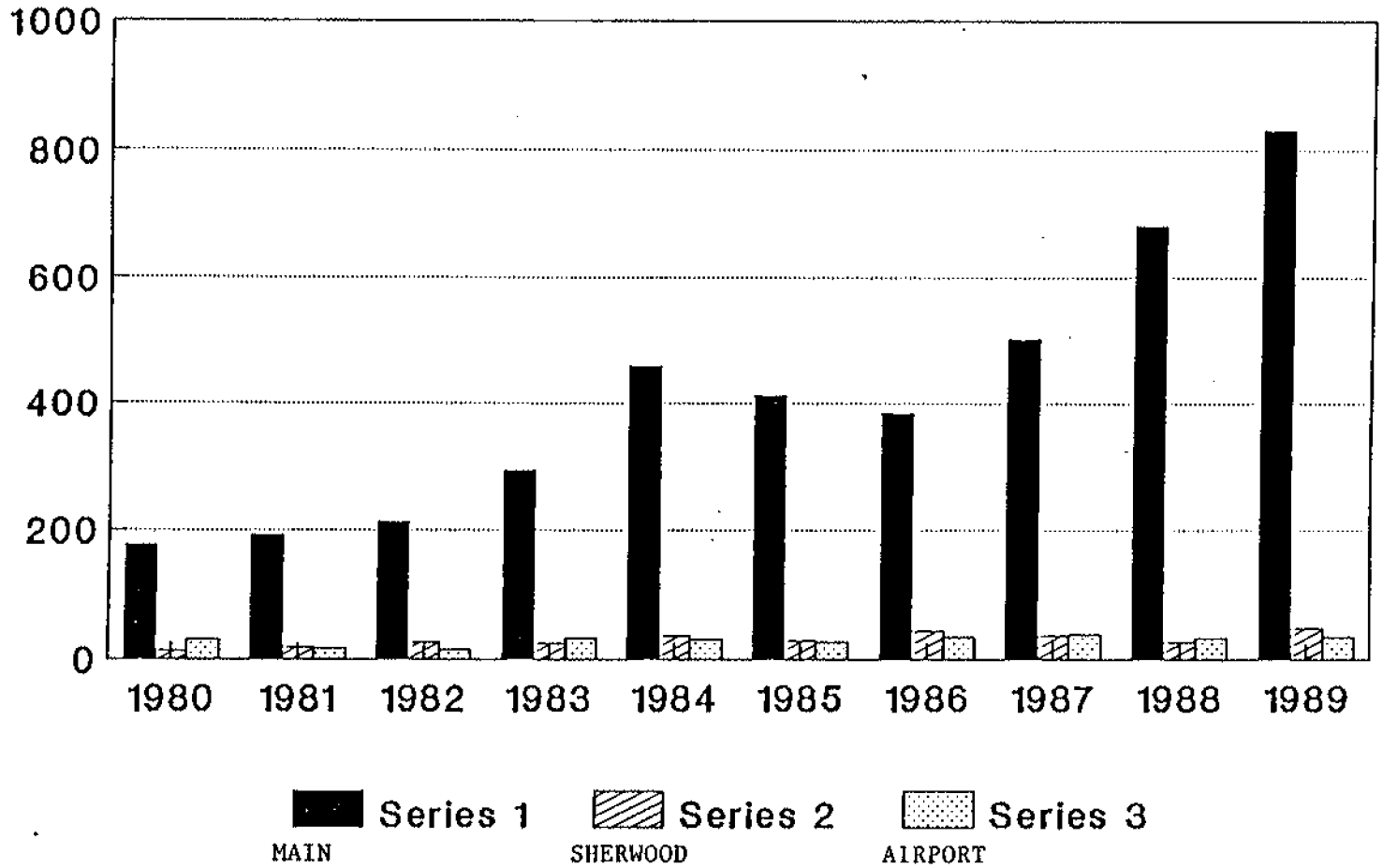


Figure 6-3 (Main, Sherwood, Airport)

1980-1989
Responses by Type - Main

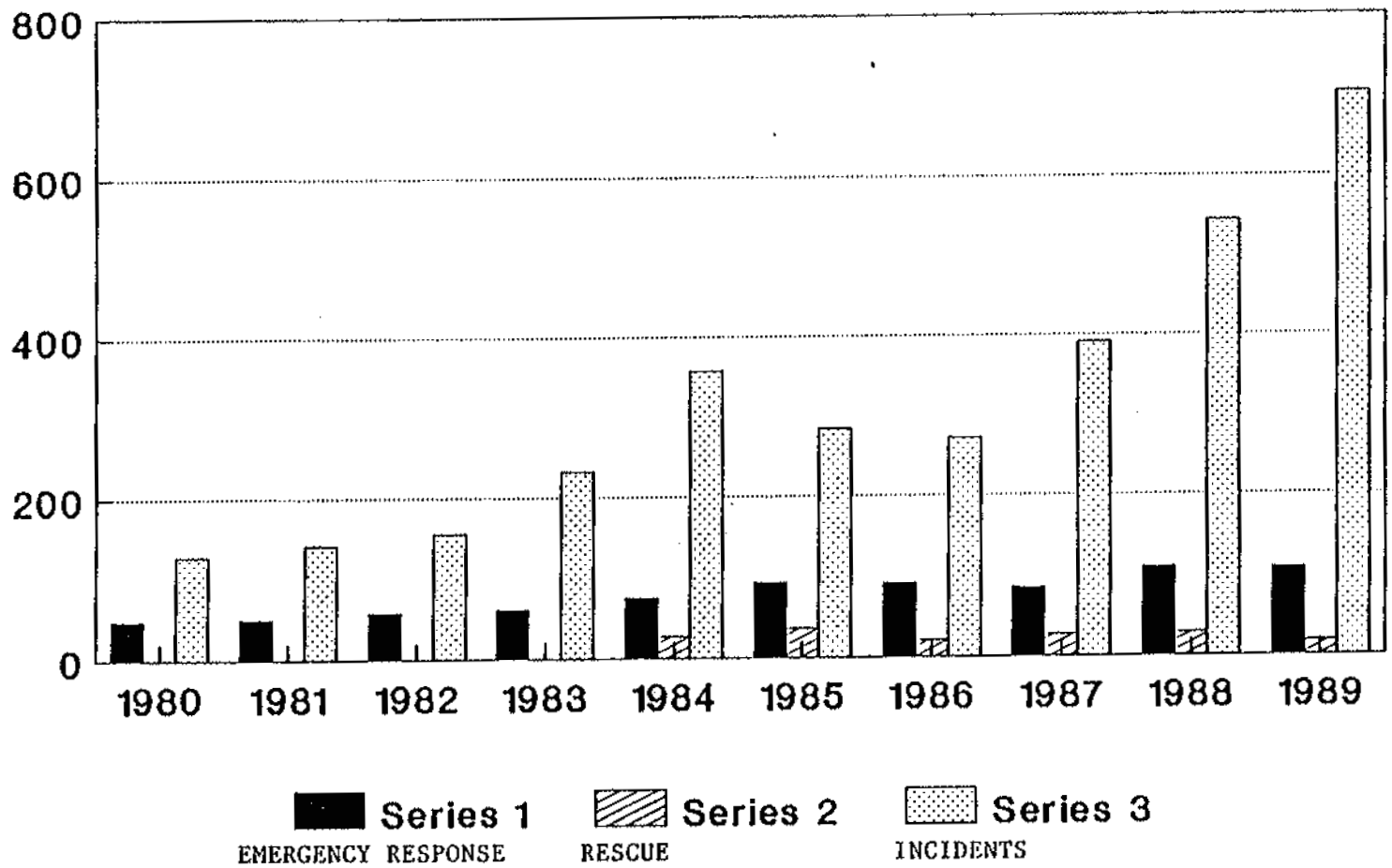


Figure 6-4

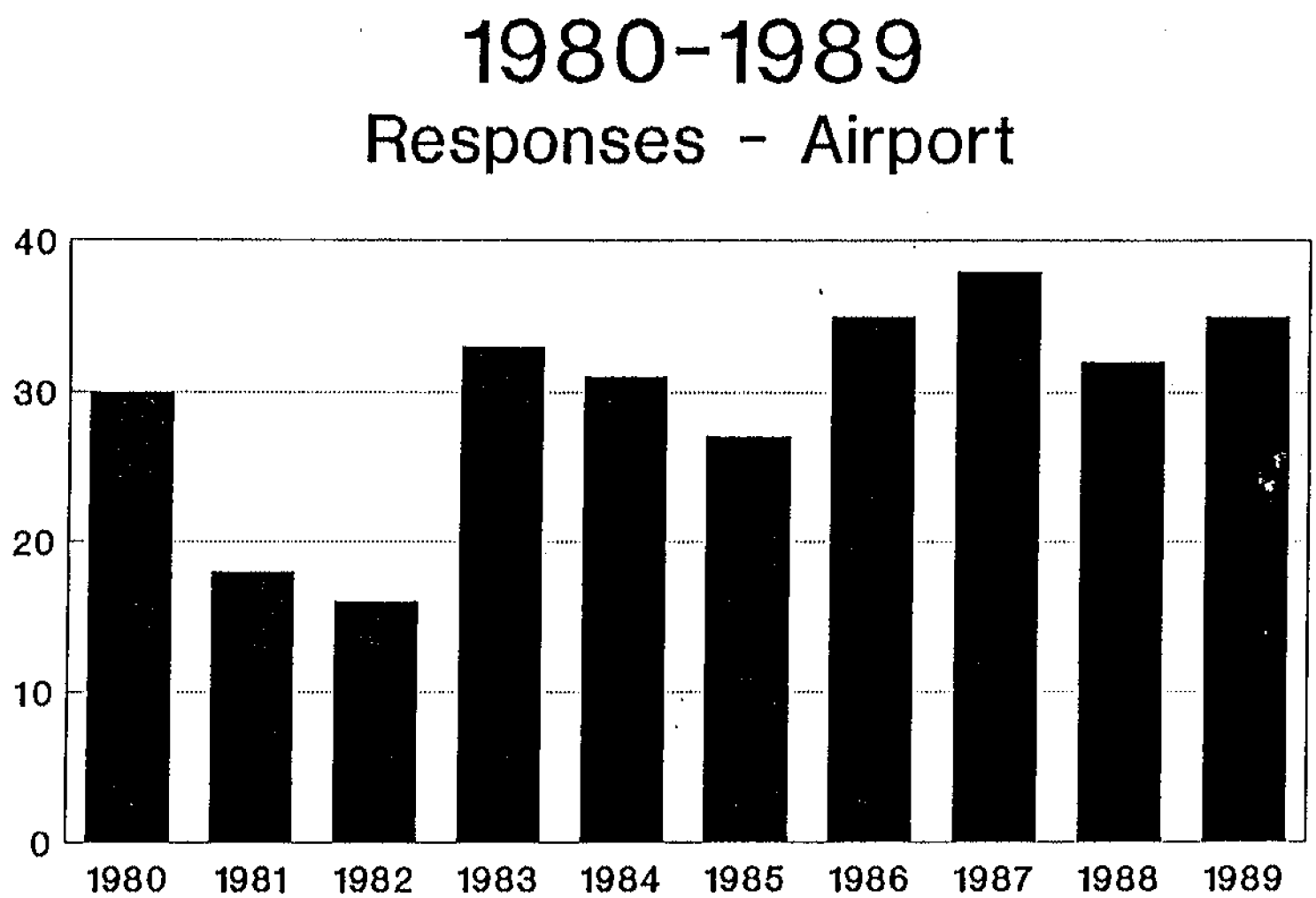

1980-1989
Responses - Airport
40
30
20
10
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

Figure 6-5

1980-1989
Responses- Sherwood

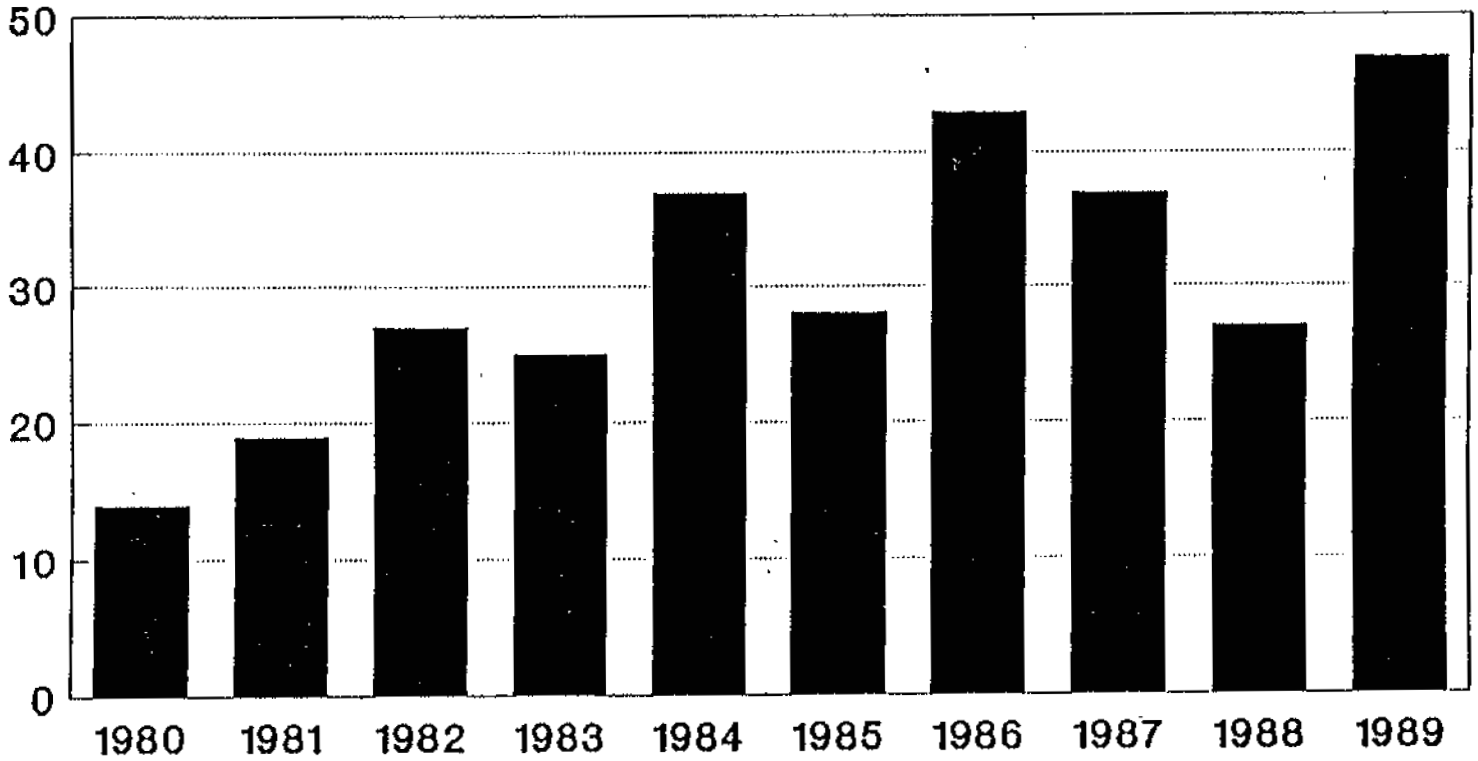
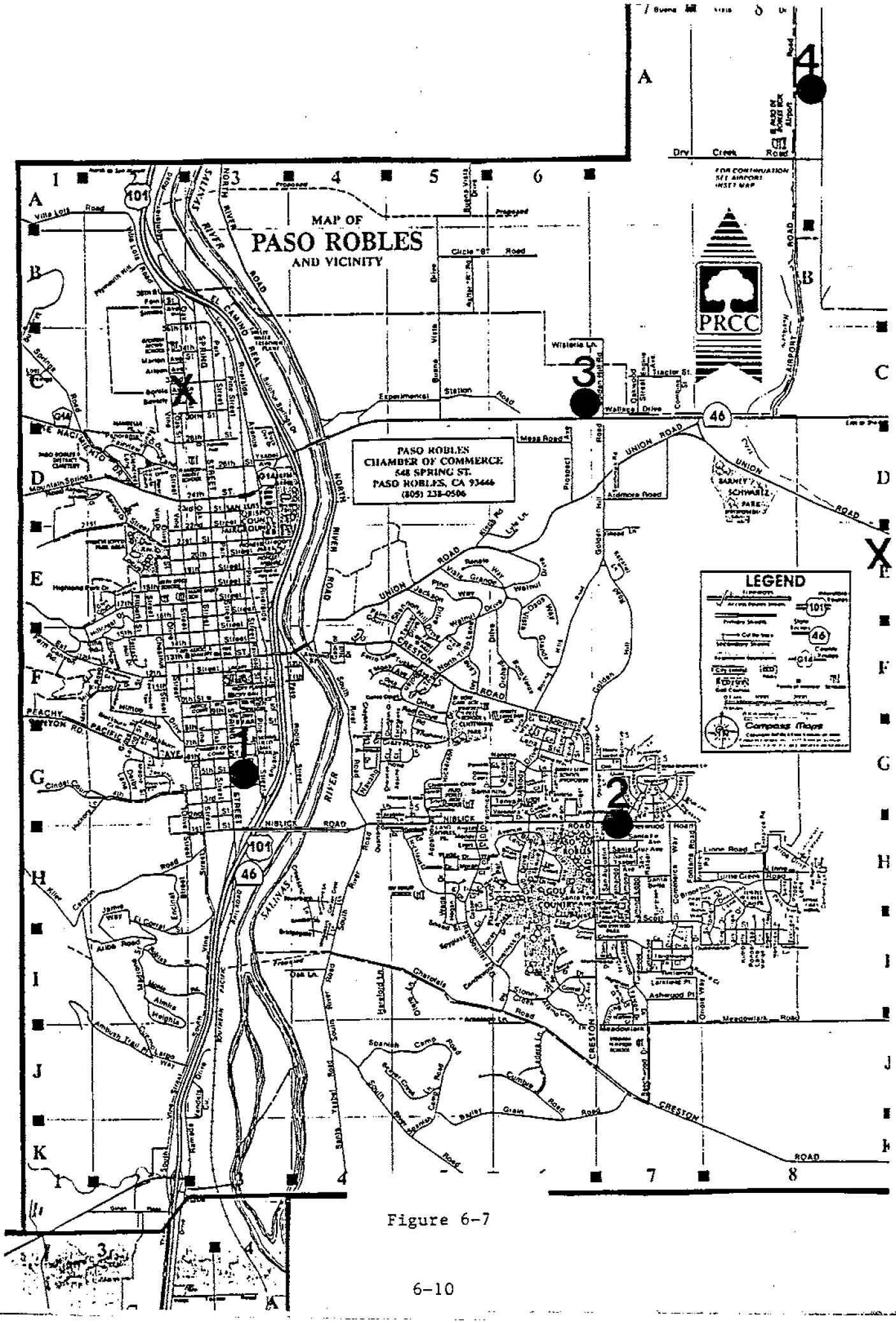


FIGURE 6-6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AND VICINITY
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CHAMBER OF COMMERCE
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PASO ROBLES, CA 93446
(805) 238-0506
PRCC
LEGEND
Compass Maps
EL CAMINO REAL
UNION ROAD
NIBLICK ROAD
CRESTON ROAD
SALINAS RIVER
NORTH RIVER ROAD
SOUTH RIVER ROAD
Dry Creek Road
FOR CONTINUATION SEE AIRPORT INSET MAP
Experimental Station Road
Wisteria Ln.
Wallace Drive
Mesa Road
Aldmore Road
Meadowlark Road
Spanish Camp Road
Santa Cruz Ave
Lupine Creek Road
Ashwood Pl
Oak Ln.
Chandelis
Stoney Creek Road
Golden Hill Road
Vine Street
Spring Street
Pine Street
Oak Street
Walnut Drive
Jackson Drive
Pacific Street
Peachy Canyon Rd.
Ambush Trail Pl.
Almira Heights
Vista Grande
Renee Way
Kiowa Way
Kiowa Rd
Lake Ln.
Prospect Hill Road
Buena Vista Drive
Circle "B" Road
Vista Lola Road
Mountain Springs Road
Highland Park Dr
Cinder Court
Kiley Canyon Road
Bonney Schwartz Park
Sherwood Road
Golden Hill Road
Creston Road
Bryant Grain Road
Tidal Road
Southern Pacific Railroad
Salinas River
North River
South River
101
46
1
2
3
4
X

Figure 6-7

response average). Travel averaged between 1.6 and 1.8 miles for each 3 minutes of travel time. This data was then transferred to a response map and the distances plotted in order to determine the required station coverage necessary to meet a 9 minute 90% Reflex Time standard for 90% of the incidents. Using this data it became obvious that neither the recommended 9 minute 90% or 10 minute 95% standards can be met with the present fire station configuration.

It should be emphasized that the response time illustrated is only an average. If the longest response time reported during 1989 were utilized, the Reflex Time period would be considerably longer. Figure 6-3 is provided in order to illustrate the approximate position on the Fire Growth vs Reflex Time Chart for the Paso Robles Fire Department.

Further plotting of this data resulted in the determination that one additional fire station should be constructed within the City of Paso Robles in order to meet Reflex Time Standards recommended in Section 3 of this report. Response time plotting also took into consideration future buildout within the City of Paso Robles and in particular future construction anticipated to occur in the east and north-easterly portions of the City. Figure 6-7 illustrates Hunt Research Corporations recommended City of Paso Robles fire station configuration at build-out.

RECOMMENDATION 6-2

The City of El Paso de Robles should deploy its fire resources in order to initiate suppression actions prior to flashover.

Much of the basis for the future location of fire stations within the City of Paso Robles depend upon a decision as to whether or not the present "Main" station will be relocated. It has been suggested that there is a possibility that the station could be relocated to the area of 4th and Spring Streets. It is the opinion of HRC that this particular location optimizes the recommended four station configuration for the City. If the main station is not relocated it would become necessary to refurbish the existing facility in order to accommodate the recommended Fire Department reorganization in order to meet the anticipated increasing demands for fire services, and, in order to accommodate Recommendation 6-2:

RECOMMENDATION 6-3

A new Fire Station should be constructed in the area of Highway 46 and Golden Hill Road that would meet the needs of the City for the next 50 years.

Construction and staffing of the facility identified in Recommendation 6-3 should meet population demands for fire protection services through build-out expected to occur by the year 2010. If, however, future development occurs beyond present

planning expectations in the westerly and north-westerly portions of the City, or if future annexations occur which increase the demand for fire services, HRC has identified two additional "Phantom" locations also illustrated in Figure 6-7. The "Phantom" locations have been identified for the area of Spring Street, between 24th and 36th Streets and in view of anticipated growth and the potential for future annexation of area east and south of the present airport, the Project Team feels that strong consideration be given to the acquisition of property in this area should a need for future fire protection be identified.

These locations are only recommended should future development dictate a demand for increased fire protection in the areas indicated. The Fire Department should review these proposals on an ongoing basis to confirm that they will remain as viable sites based upon growth, traffic congestion, incident demands, and road conditions.

6.4 Fire Apparatus Standards (NFPA 1901)

Standard 1901, applies to all Fire Department motorized apparatus used by fire departments for the purpose of firefighting operations. The standard was developed to provide the necessary guidelines to be used in the purchase of firefighting apparatus including:

1- Pumpers

2- Mobile Water Supply Apparatus

3- Aerial Ladders

4- Elevating Platforms

This standard provides the basis for the acquisition of suitable equipment the needs of the community. It should also be understood that there is no legal basis for meeting the requirements of this standard. The standard does, however, cite those appropriate federal requirements with which apparatus manufacturers must comply in order to meet Federal Motor Vehicle Safety Standards. In this respect Standard 1901 becomes invaluable when developing local apparatus specifications and assuring that legal manufacturing requirements are met. In addition, a level of consistency in the design and manufacturing of fire apparatus is attained as the recommendations contained within this standard are emphasized during the preparation of local apparatus specifications.

In order to more clearly identify the various types of fire apparatus in use within the fire service, the following definitions have been excerpted from NFPA-1901.

1- Aerial Ladder Truck - A ladder truck equipped with a permanently mounted, power operated aerial ladder.

2- Elevating Platform Apparatus - A ladder truck equipped with permanently mounted, power operated booms of articulating construction or telescoping construction; or a combination of articulating and telescoping construction; and with a passenger carrying platform attached to the uppermost boom. (Often referred to as a "Snorkel.")

3- Fire Apparatus - The emergency vehicles of the fire department or fire brigade used for fire suppression.

4- Ladder Truck - A piece of fire apparatus carrying at least the standard compliment of ground ladders.

5- *Light Attack Vehicle - A unit equipped with only a booster pump with no more than three designated seating

positions, carrying a limited amount of equipment.

6- *Pumper - A piece of fire apparatus with a permanently mounted fire pump with a rated discharge capacity of 500 gpm or greater, complying with Standard 1901, and may also include a water tank and a hose body.

7- Pumper-Ladder-Truck - A ladder truck plus the addition of a fire pump, and may also include a water tank and hose body.

8- Quadruple Ladder Truck - A service ladder truck with the addition of a fire pump, water tank and hose body, (May also be referred to as a "Quad.")

9- Quintuple Ladder Truck - A quadruple ladder truck with the addition of an aerial ladder device. (Also referred to as a "Quint.")

* Apparatus in the Paso Robles Fire Department inventory.

During the course of preparing this report random surveys were conducted of fire apparatus for basic compliance with the provisions contained within Standard 1901. Pumpers/Engines were surveyed for:

- o Carrying capacity
- o Manner Powered (Gasoline/Diesel)
- o Pump capacity
- o Hose bed compartmentation
- o Water tank capacity
- o Basic equipment

From the survey conducted, together with information provided by interviewed personnel, first-line and reserve apparatus would appear to meet NFPA Standard 1901.

RECOMMENDATION 6-4

That the El Paso de Robles Fire Department continue to utilize NFPA Standard 1901, whenever possible, in order to maintain standardization of specifications for fire apparatus.

Acceptance of this Recommendation will help to insure that the City of Paso Robles will attain the greatest apparatus performance level for dollars spent, thereby providing the most cost effective basis for apparatus acquisition.

6.5 Apparatus Operations

Fire Department operations within the City of Paso Robles are supported by a total of three first-line engines, i.e., pumpers. There are presently no Ladder Truck apparatus within the Fire

Department inventory of equipment. Three reserve engines are used to provide a back-up for the first-line engines in the event of a breakdown or at such time as additional equipment is required as might be the case during a major emergency.

The engine company is commonly thought of as the basic work unit of the Fire Department, providing pumping capacity, hose, water, and personnel. Under fireground conditions, it is a generally accepted fact that about two-thirds of firefighting operations are accomplished at the engine company level. In as much as there are no ladder trucks within the Fire Department inventory, all of the functions normally associated with Ladder Truck assignments must be accomplished by Engine Company personnel. Ladder Truck tactical functions are designed to support Engine Company operations and are assumed to provide approximately one-third of the fireground tactical operations. Personnel assigned to these apparatus are typically assigned duties that include search and rescue, ventilation, salvage and overhaul. In addition to the above described apparatus, the Department inventory also includes a rescue vehicle, and quick attack apparatus which may be utilized for wildland fire response. A crash/fire rescue unit is also assigned to the airport.

Apparatus surveyed were considered to be in generally good condition, however, lack of a definitive preventative maintenance and inspection program, conducted on a regular basis, should be considered as a serious deficiency in the overall operation of the Department.

RECOMMENDATION 6-5

The Fire Department should immediately institute a program to provide at minimum, a weekly inspection of all fire apparatus and equipment assigned to each piece of equipment.

At the present time there is no assurance that apparatus is left in a serviceable and ready condition upon returning from quarters after an alarm. A review of apparatus records indicated that several days may pass before apparatus condition is checked and apparatus are verified ready for response.

The equipment survey process also identified the fact that certain apparatus identified in this report are in need of immediate replacement due to age, condition, and current and or anticipated need and use. One piece of equipment, as a result of its present station assignment and intended use, Airport, will be excluded for a replacement recommendation at the present time. All apparatus will be identified in subsequent replacement Tables contained in this Section of the Report.

6.6 Apparatus Pumping Capacity

The pumping capacity of all City of Paso Robles Fire Department engines surveyed, including reserve engines, indicated that they are all rated at least at 1000 gallons per minute pumping capacity. The two newest engines located at the Main Station and at the Airport are rated at 1250 and 1500 gallons per minute respectively. This level of pumping capacity provides the Department with the ability to deliver large volumes of water during a major emergency, and, in effect helps to some degree to augment current minimal staffing levels. It should be noted that the rated capacity of all Paso Robles Fire Department pumpers is sufficiently greater than the minimum (500 gpm) recognized as the minimum rated capacity for pumpers. This pumping capacity, available to support fireground operations is extremely vital to the Incident Commander when deploying equipment and personnel and should not be sacrificed for lesser capability equipment. Maximum pumping capability therefore becomes an essential part of the overall fire department operation as well as certain automated features available for pumpers, e.g., automated ladders and water towers which can provide invaluable support for fireground operations. The ability for all engine companies to "move-up" and support fireground operations also is extremely vital to the success to any fireground operation and the including the ability of the Incident Commander to properly deploy appropriate personnel and equipment. Therefore, the following recommendation is made:

RECOMMENDATION 6-6

Apparatus assigned to stations identified as Main and Sherwood, upon replacement or reassignment, should be replaced with apparatus providing a minimum 1500 gpm pumping capacity and be equipped with automated aerial ladders and water tower capability. Aerial ladder length should not be less than 50 feet.

Under this concept, automated aerial ladder and water tower capability would be available at two of the four fire station configuration recommended in Section 4 of this Report.

6.7 Apparatus Refurbishment

The Paso Robles Fire Department has undertaken a limited program to refurbish certain apparatus, (209), identified as in need of this type of program in order to maximize the useful life of the apparatus. The refurbishment of fire apparatus has gained in popularity over the past 15-20 years and in many departments today has actually become an integral part of the apparatus replacement program.

Apparatus refurbishment is generally accomplished by one of two methods. The first is a total refurbishment of the apparatus

including the power train, drive train, fire pump, transmissions, painting and compartmentation, etc. This process is extremely costly however, depending upon needs and financial constraints may be the preferred method over the purchase of new apparatus. The second method often entails more of a cosmetic approach that primarily includes painting body work and minor maintenance that may include engine/transmission replacement. In either case, an agency is still left with an older piece of equipment since all of the apparatus components are generally not replaced. Therefore, the decision to refurbish or not to refurbish should be based upon extending the useful life of a piece of equipment, but never to the extent that would gain the maximum life expectancy from new apparatus. Apparatus refurbishment, therefore, should be accomplished on a selective basis and never used as the overall methodology for apparatus replacement.

6.8 Apparatus Replacement

Although no definitive standards for the useful life expectancy of fire apparatus exists today, fire apparatus replacement (engines), is generally based upon a replacement life cycle of 10-15 years for first-line service, with an additional period of five years for reserve status. In addition, refurbishment, such as that taken on Engine 209 may add additional useful life to the apparatus. It has been a generally accepted fact that useful life of any apparatus should not extend beyond 24-25 years due to decreased reliability, increased maintenance costs and losses in apparatus and personnel efficiency as a result of advances in apparatus technology.

The Fire Department currently maintains three first-line engines and three reserve engines as backup. Again no definitive standard exists today upon which to base a ratio of the number of reserve engines to first-line engines. The Insurance Services Office (ISO) recommends one reserve engine for each eight first-line engines in service, and one additional reserve engine for any fraction beyond eight first-line engines. Applying this rationale, one engine would be required in reserve. The National Fire Protection Association (NFPA), however, points out that many departments use a percentage factor of 25-33 percent for the amount of reserve apparatus in order to properly back-up first-line apparatus. Applying this rationale the Paso Robles Fire Department would still be required to maintain one reserve engine.

Based upon the anticipated workload increase expected for a growing community and an expanding Department necessary to meet community demands for service along with the Recommended Preferred Delivery System Design, Hunt Research Corporation makes the following recommendations:

RECOMMENDATION 6-11

That the Fire Department maintain two engines as reserve backup for first-line engines.

RECOMMENDATION 6-12

That the El Paso de Robles Fire Department adopt a maximum life expectancy replacement policy for all engines of 22.5 years*. This recommendation incorporates a minimum life expectancy of 15 years for first-line service, the remainder of which could combine first-line and reserve service time in order to reach maximum useful life expectancy.

* Adoption of Recommendation 6-12 would require an engine to be replaced every **3.75 years.** Refer to Table 6-1 for the Recommended Replacement Schedule.

Example: 4 first-line engines (At Buildout)
2 reserve engines

6 TOTAL ENGINES — 22.5 max. life expectancy
6 engines = **3.75 repl. cycle**

Table 6-2 provides the recommended Apparatus Longevity and Recommended Replacement Schedule for the City of Paso Robles Fire Department. It is important that these schedules be adopted in order to provide for an orderly apparatus replacement program and is intended to provide a "pro-active" basis for apparatus replacement rather than the often used traditional reactive style of management.

TABLE 6-2

Paso Robles Fire Department

Apparatus Longevity and Recommended Replacement Schedule

The following schedule, meets the requirements contained in Recommendation 6-12 by creating the necessary 3.75 year replacement cycle for pumpers/engines. In the process, it became apparent that in order to develop the necessary cycling rationale, additional consideration would have to be given for apparatus which had been purchased within relatively short time spans of each other or refurbished. In setting the recommended replacement schedule, Hunt Research Corporation has attempted to convey these considerations.

	Date In-service	Refurb.	Status	Recomm. Repl.
ENGINE				
203	1952	No	Reserve	1991
206	1960	No	Reserve	Delete
209	1972	Yes	First-Line	2000
210	1981	No	Reserve	2004
200	1987	No	First-Line	2010
214	1989	No	First-Line	2014
OK. ATK.	1986	--	--	1998
	1987	--	--	1999

SECTION VII

RECOMMENDED EL PASO de ROBLES FIRE DEPARTMENT

SYSTEM DESIGN

7.1 Quality and Cost Effectiveness of Services

An evaluation of public fire protection must take into account a number of factors such as what there is to burn, the life hazard that exists, fire frequency, climatic conditions, demographic and geographic factors, and a basic understanding of just what kind of role a public fire department is expected or required to play in providing public fire protection. Failure to adequately consider any of these factors may lead to large fire losses and unnecessary loss of life. In addition, the changing role of the fire service today and how that role fits into the needs of the community needs to be addressed. For example, there can be no argument that the provision of Emergency Medical Services occupies the majority of operational time in the fire service today, often occupying as much as 55%-70% of personnel time , depending upon the level and type of service provided. In the case of the Paso Robles Fire Department the level is rapidly approaching the 55%-60% level of activity. The City of El Paso de Robles has opted to provide an identified role in support of Emergency Medical Services within the community at the Basic Life Support (BLS) level. In so doing, an entire program level of service has been identified and will continue to grow as the City matures.

As a extremely labor intensive organization, approximately 80%-90% of a fire department's budget is historically utilized in support of its personnel, i.e., salaries, benefits, insurance, etc. And, most often, the only visible product for a fire department to show is its effectiveness in combatting fire OR, as in the case with those pro-active departments, prevention of fire. Fire Prevention programs become more difficult to measure, however, it is the true product of an efficient department and its use of personnel.

The dawning of a new age has finally emerged for the fire service with the realization that it is no longer possible to add personnel, stations, and apparatus and to continue to combat fire from this traditional role. Today, those departments which have made a change or are in the process of changing to a more pro-active role of providing fire delivery programs to the community are sending a message to their own communities that there is a better way to combat the community's fire problem. Reliable company inspection programs along with programs for community public education, today, are accepted methodology for a pro-active fire delivery system. Although there will always be a need for

firefighters to provide the reactive role needed in responding to a fire emergency, it should be acknowledged that the traditional role will slowly disappear and be replaced with the more pro-active approach to fire protection. As such the City of El Paso de Robles has the unique opportunity, TODAY, to build a cost effective pro-active program designed to meet the community needs in the year 2000. **The recommended system design will reflect a tri-part, unified organization, comprised of Career, Volunteer/Career, and Volunteer personnel; providing the full range of services expected to be provided by a pro-active municipal fire department.**

7.2 Recommended System Design

This section of the Report deals with the recommended system design and the program methodology needed to be developed. The fundamental concept of the system is the provision of a high level of fire protection on an equitable basis to all residents and businesses within the City of El Paso de Robles. These services would be provided through:

(a) Expanded fire prevention programs, including stronger codes, enhanced inspection and enforcement, and an extensive program of public education.

(b) Increased use of smoke detectors and automatic suppression and detection systems in existing as well as new structures.

(c) A fourth fire station.

(d) Use of volunteer personnel in specialized applications, i.e., fire operations, prevention, public education, EMS response, and administrative support.

(e) Maintenance of efficient management, administration, and support of Department resources.

(f) A fire delivery system in place by the year 2000.

Thus, the system design consists of a comprehensive program to prevent the occurrence of fire, and to reduce the consequences should a fire occur, backed up by a strong manual suppression and public education capability -- that is, fire prevention becomes the fundamental basis for the City of El Paso de Robles fire protection system.

As a result of the process used to prepare this Report, the Hunt Research Team has compiled the following list of Department programs which the Team feels best reflects the actual mission of the Department in a pro-active effort in order to minimize the effect of fire and/or natural or man caused disasters upon the residents and business community of the City of El Paso de Robles.

These programs are presented in descending order of importance as follows:

1- Department Priorities

(a) All residents and areas of the City should receive an equivalent base level of service. "Base Level of Service" is defined as the ability to provide Emergency Medical Service at the Basic Life Support (BLS) level meeting Reflex Time requirements, public education, home inspections upon request, fire response and suppression meeting Reflex Time requirements, overhaul, immediate salvage, as required, to prevent further damage, response to hazardous materials incidents, rescue, and response to miscellaneous emergencies and other public service activities.

(b) The Fire Department should establish, as a result of recommendations contained within this Report, attainable Program Goals and Objectives, with the participation of City Management, Department personnel which include career and volunteer on an equitable basis. These Goals and Objectives should reflect commitment and accountability on the part of all participants.

2- Department Mission in Priority Order

(a) Provide EMS at the Basic Life Support (BLS) level, with a goal of 50% survival rate for cardiac arrest.

(b) Occupancy Inspection and Code Enforcement

(c) Public Education

(d) Rapid response to fires, hazardous materials incidents, rescue and other incidents which may occur.

(e) Support for built-in automatic suppression systems.

(f) Manual suppression.

(g) Overhaul and immediate salvage.

(h) Public service.

(i) Users of special services to pay the actual "Marginal Cost" associated with the service. These services would include: Commercial Inspections, Plan Checking, Hazardous Materials Planning, and Code Enforcement.

(j) Reflex Time should be adopted as the official response time basis for establishing service delivery response requirements.

The preferred site has been identified by HRC as in the area of Highway 46 and Golden Hill Road.

(b) Implement a career development program for Volunteer Firefighters who desire a fire service career opportunity with the Paso Robles Fire Department. Identify the administrative mechanism to utilize Volunteer/Career firefighters to augment regular on-duty staffing. Appoint 4 firefighters from this program.

(c) Hire 3 firefighters.(1 Captain, 2 Engineers)

(d) Assess the impact of construction on fire service delivery in the eastern and northeastern portions of the City.

(e) Identify funding mechanism to be utilized for construction of Station #4.

(f) Provide City Council with a report on Fire Department Delivery System Implementation Plan.

(g) Adjust schedule as required.

(h) Assess the need for a Fire Inspector (plans checking, inspections, etc.) if warranted as the result of increased construction, inspection/code enforcement, and public education programs.

Fiscal Year 1992-1993

(a) Assess the impact of construction on fire service delivery in the eastern and northeastern portion of the City.

(b) Hire 4 firefighters.(2 Captain, 2 Engineers)

(c) Provide City Council with a report on Fire Department Delivery System Implementation Plan.

(d) Adjust schedule as required.

Fiscal Year 1993-1994

(a) Hire 5 firefighters.(2 Captain, 3 Engineer) Appoint 3 firefighters.

(b) Acquire the preferred site for Station #4 and begin the required administrative review process.

(c) Assess the impact of construction on fire service delivery in the eastern and northeastern portion of the City. This process becomes extremely critical for construction of Station #4 and the hiring of personnel needed to staff the facility.

(d) Provide City Council with a report on Fire Department Delivery System Implementation Plan.

Fiscal Year 1994-1995

(a) Hire 4 firefighters.(1 Captain, 3 Engineers) Appoint 2 firefighters.

(b) Provide City Council with a report on Fire Department Delivery System Implementation Plan.

(c) Adjust schedule as required.

Fiscal Year 1995-1996

(a) Hire 1 firefighter.(1 Engineer) Appoint 1 firefighter.

(b) Based on needs assessment, hire architect and prepare architectural design for Station #4.

(c) Provide City Council with a status report on Fire Department Delivery System Implementation Plan.

(d) Adjust schedule as required.

Fiscal Year 1996-1997

(a) Solicit bids and initiate construction of Fire Station #4. (Based upon ongoing needs assessment)

(b) Hire 4 firefighters(4 Captains) Appoint 1 firefighter.

(c) Provide City Council with a status report on Fire Department Delivery System Implementation Plan.

(d) Adjust schedule as required.

Fiscal Year 1997-1998

(a) Hire 4 firefighters (4 Engineers) Appoint 1 firefighter.

(b) Provide City Council with a status report on Fire Department Delivery System Implementation Plan.

(c) Adjust schedule as required.

Fiscal Year 1998-1999

(a) Appoint 3 firefighters

1998-1999 concludes the recommended Implementation Plan dependant upon implementation schedules associated with annual needs assessments and the funding necessary to implement station

construction and staffing needs.

In conclusion, Hunt Research Corporation would like to thank all of those individuals who gave so generously of their time in order to assist in the timely completion of this Report. We would also caution that the Report contains some good and some bad, depending upon the individual position. However, if the Report and its Recommendations are to be successful, to pick and choose is not an option. In other words, the Report should be looked upon as a package and be accepted as such. In taking this position a WIN/WIN situation is then created for all involved.

TABLE 7-1

APPARATUS/PERSONNEL STAFFING

Station-1 (MAIN)

Engine:
- Captain(Career)
- Engineer(Career)
- Firefighter(Vol./Career)*

Rescue:
- Engineer(Career)
- Firefighter(Vol./Career)*
- *Firefighter rotates between Engine and Rescue

Station-2 (SHERWOOD)

Engine:
- Captain(Career)
- Engineer(Career)
- Firefighter(Vol./Career)

Station-3 (GOLDEN)

Engine:
- Captain(Career)
- Engineer(Career)
- Firefighter(Vol./Career)

Station-4 (AIRPORT)

Engine:
- Engineer(Career)

Crash/Rescue:
- Captain(Career)
- Firefighter(Vol./Career)

Department Staffing Career:

F.C.(1)
B.C.(3)
Clerk(1)
Capt.(12)
Engr.(16)

Department Staffing Volunteer:

Vol./Career Firefighter (15)
Volunteer(20) Utilized on all second or greater alarms and special details.

TABLE 7-2

FIRE STATION

STAFFING MATRIX

	MAIN	SHERWOOD	AIRPORT	GOLDEN
1990-1991	1-Capt. 1-Engr.	1-Capt.		
1991-1992	1-Capt. 1-Engr. 2-F.F.*	1-Engr. 2- F.F.*		
1992-1993	1-Engr.	1-Capt. 1-Engr.	1-Capt.**	
1993-1994	1-Capt. 2-Engr. 2-F.F.*	1-Capt. 1-F.F.*	1-Engr.**	
1994-1995	2-Engr. 2-F.F.*	1-Engr.	1-Capt.**	
1995-1996			1-Engr.** 1-F.F.*	
1996-1997			1-Capt.** 1-F.F.*	3-Capt.
1997-1998			1-Engr.** 1-F.F.*	3-Engr.
1998-1999				3-F.F.*

* Vol/Career Firefighters
** Add personnel as demand for service dictates

PASO ROBLES FIRE DEPARTMENT

ADMINISTRATIVE MATRIX - 1990

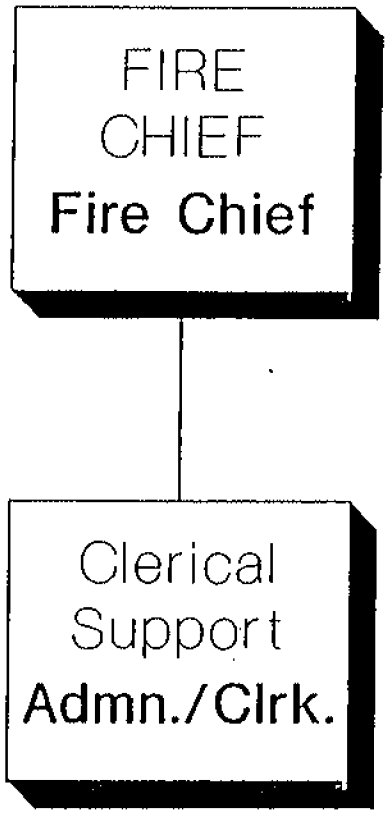

FIGURE 7-1

PASO ROBLES FIRE DEPARTMENT
CHIEF OFFICER MATRIX

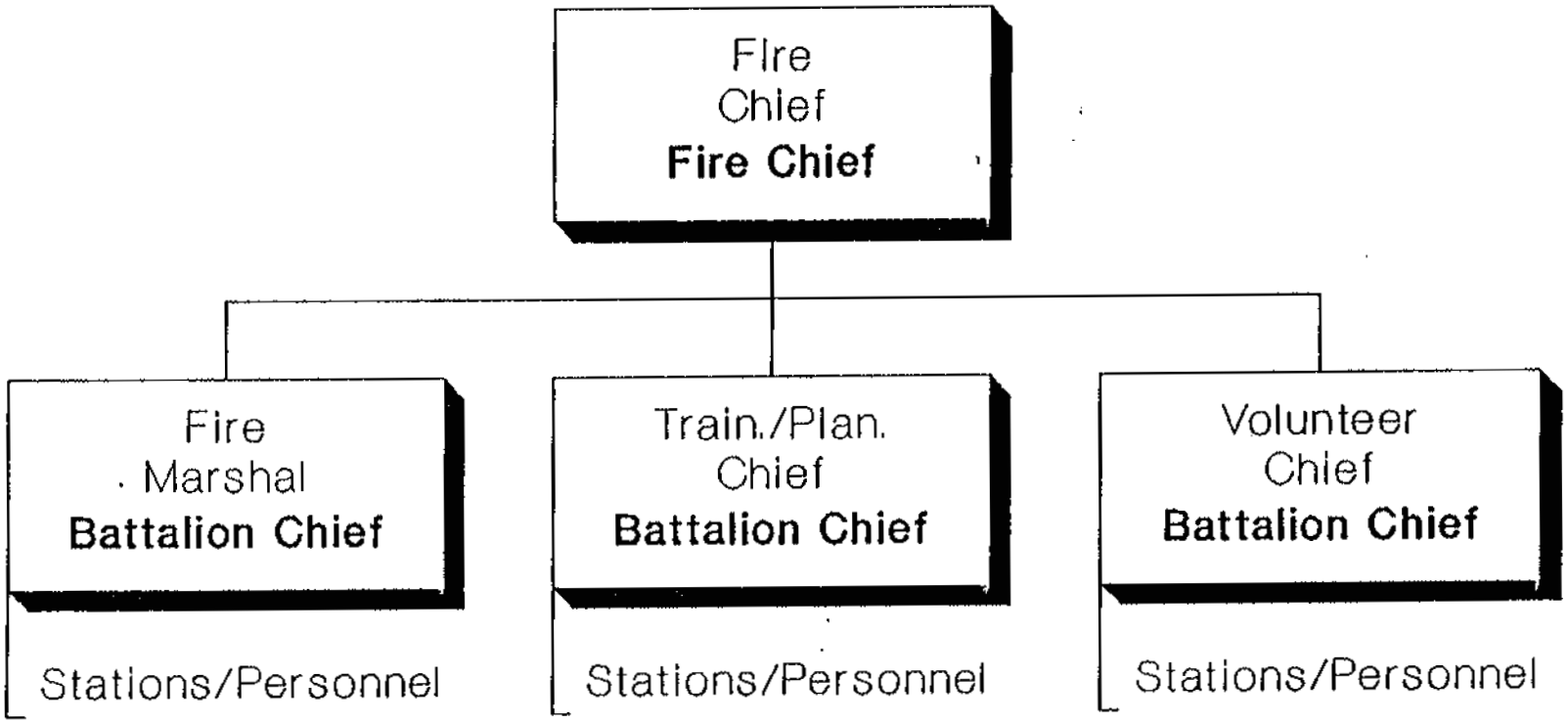

FIGURE 7-2

PASO ROBLES FIRE DEPARTMENT

REORGANIZATION MATRIX - 1990's

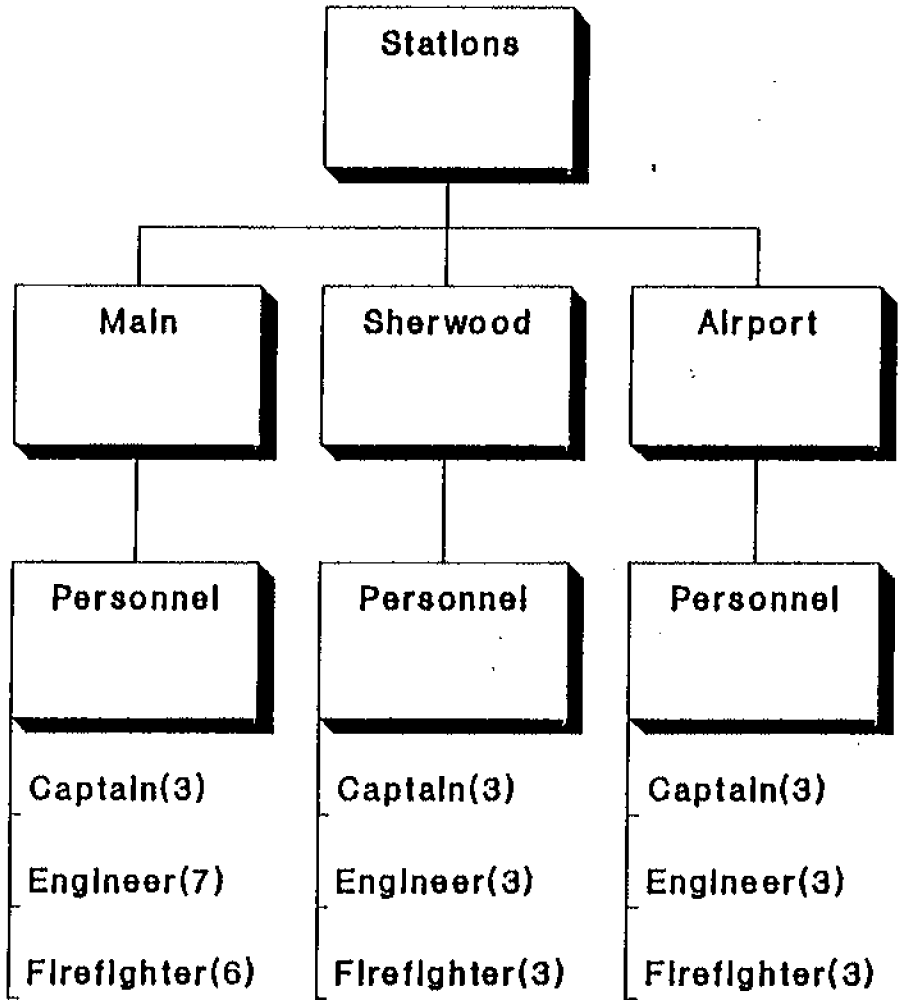

FIGURE 7-3

PASO ROBLES FIRE DEPARTMENT
REORGANIZATION MATRIX - 2000

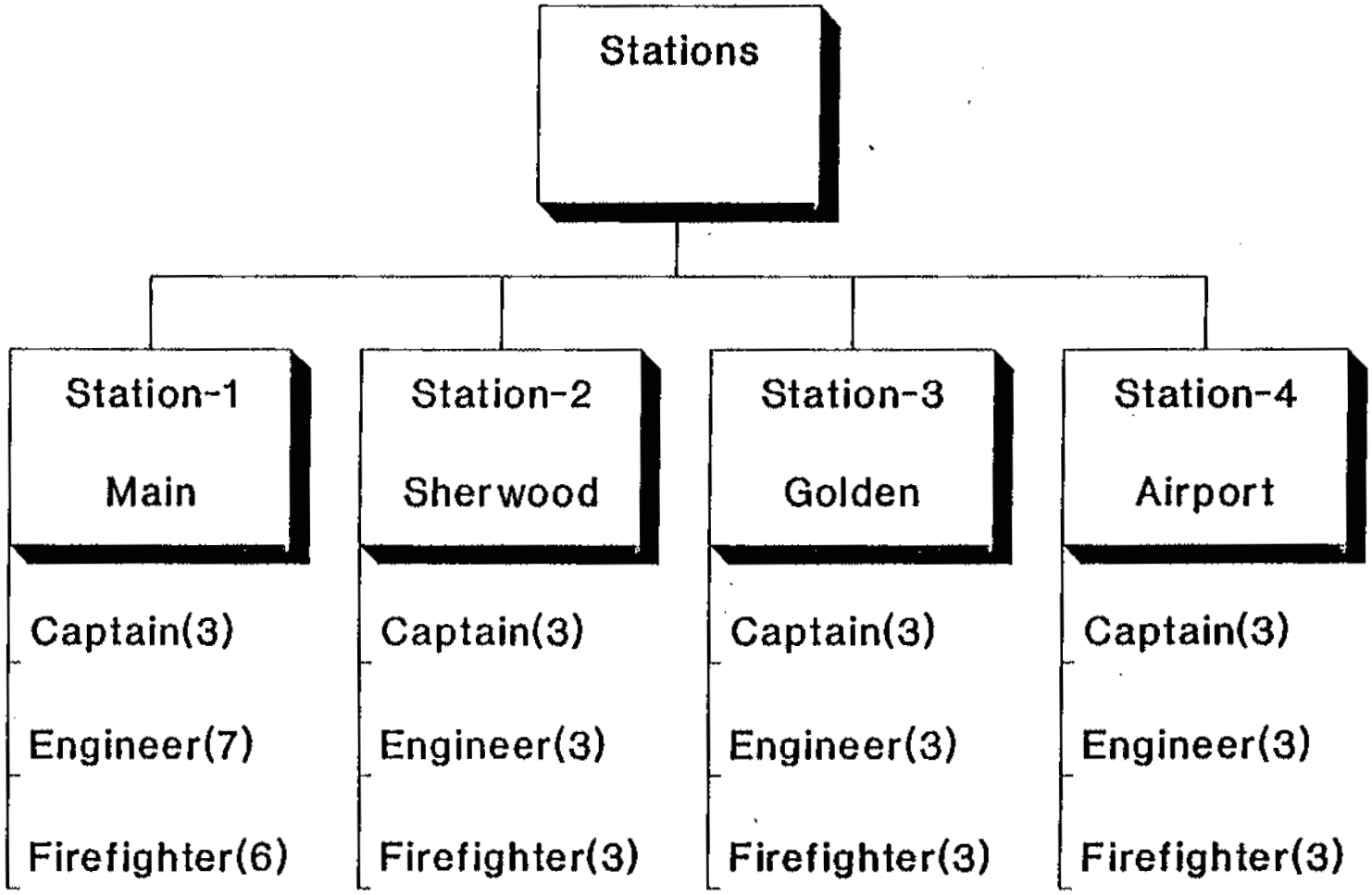

FIGURE 7-4

APPENDIX A

GLOSSARY

Aerial Ladder Truck - A ladder truck equipped with a permanently mounted, power operated aerial ladder.

Advanced Life Support (ALS) Function - The successful conduct of a patient assessment and initiation of definitive care measures to intubate, defibrillate, and medicate a patient in the field, and transport the patient to the hospital.

Basic Life Support (BLS) Function - The successful conduct of a patient assessment and initiation of CPR when cardiac arrest conditions are established, or first aid as appropriate.

CPR - Cardiopulmonary Resuscitation.

Detection - The period of time from initiation of event until it is discovered by an individual who contacts the Public Safety Answering Point (Dispatch Center).

Dispatch of Units - The interval between the time a call is received by the Dispatch Center and responding units are notified.

EMS - Emergency Medical Service.

EMT - Emergency Medical Technician.

Fire Flow - The estimated water delivery rate in gallons per minute required to provide adequate fire protection for a specified structure.

First Due - First unit due on an incident.

Flashover - The point at which fire gases and all combustible surfaces of a room blast into flame at once.

GPM - Gallons per Minute.

ICS - (Incident Command System) A process for managing and coordinating multi-agency and multi-jurisdictional resources assigned to an incident.

Pumper (Engine) - A piece of fire apparatus with a permanently mounted fire pump with a rated discharge capacity of 500 GPM or greater, complying with Standard 1901, and may also include a water tank and a hose body.

APPENDIX A

GLOSSARY (Continued)

Reflex Time

Fire - The time period from ignition to application of extinguishing agent.

Emergency Medical - The time from occurrence to initiation of field emergency medical definitive care.

(Reflex Time includes all of the components of the time period between occurrence and initiation of public service assistance.)

Report of Alarm - The period of time from discovery of a fire/emergency medical incident until it is reported to the dispatch center.

Setup Time - The period of time from arrival on scene until suppression or medical treatment activities are initiated.

Travel Time - The time required for the unit to drive to the scene of the incident.

Turnout Time - The time period that begins with the receipt of an alarm at a station and ends when the fire/rescue vehicle leaves the station.